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TROPICAL DISEASES BULLETIN

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 6.] 1915. [No. 8.

HELMINTHIASIS.

LEIPER (Robert T.). **Report on the Results of the Bilharzia Mission in Egypt, 1915.**—*Jl. R. Army Med. Corps.* 1915. July. Vol. 25. No. 1. pp. 1–55. With 22 figs; Aug. No. 2. pp. 147–192. With 17 figs.

The author notes that the only mode of dealing successfully with bilharziasis is to prevent its spread to uninfected persons. He illustrates the character of the disease and the corresponding financial burden from the experience of the Boer war. Of 625 men who became infected in South Africa, 359 were still on the list in 1911 exclusive of those permanently pensioned. The total cost to the State was about £10,800 per annum. Though the parasitic nature of the disease was established in 1851 nothing definite had yet been discovered of the life cycle of the parasite or its manner of entering the human body. In 1894 LOOSS formulated the hypothesis that the disease is communicable directly from man to man, and practically all research since has been directed to the experimental verification of this hypothesis. The result of the investigations into the spread of trematode infections of man in the Far East by the author threw discredit upon the LOOSS hypothesis [see this *Bulletin*, Vol. 6, p. 296]; hence the present enquiry, with which Drs. R. P. COCKIN and J. G. THOMSON were associated. The Mission arrived in Egypt on February 8th and left on July 15th, 1915.

A map of the world shows the regions from which cases have actually been reported. A search for an invertebrate intermediary has been made by COBBOLD [1870], SONSINO [1874–1885], LORTET and VIALLETON [1893–94] and by LOOSS. An account is given of these researches, especially those of LOOSS. Experiments to infect animals were made by HARLEY in 1871 and later by other workers without success. These failures to obtain experimental verification of his theory were explained away by LOOSS with the statement that man is the only known host of *Bilharzia haematobia*. The practical requirements of this theory of direct infection are indicated by abstracts from LOOSS's publications.

It has been difficult to obtain reliable statistics of the incidence of the disease in Egypt. FERGUSON stated in 1910 that more than 1,000 post-mortem examinations made by him at the Kasr el Aini Hospital in Cairo revealed the presence of the disease in 40 per cent. of Egyptian

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males between 5 and 60 years of age. Recently MacCallum in the course of his ankylostomiasis campaign has obtained higher figures.

The fresh-water molluscs of Egypt have been studied by several malacologists, the results being summarized very completely by Pallary. His list is given and it is indicated which species were examined by previous authors and by the present Mission. It is seen that eleven species were examined by Lortet, Sonsino and Looss and 27 by Leiper and his colleagues. The author continues :—

"In the Natural History section of the magnificent 'Description de l'Egypte' prepared by the authority of Napoleon during the French occupation in 1799–1801, eight of the commonest freshwater molluscs are recorded and beautifully illustrated. In three of these we have found undoubted Bilharzia larvae within half an hour's journey by tram and train from Cairo.

"These are extraordinary facts in the light of Professor Looss's repeated contention during the past twenty years that he had examined hundreds of specimens of all the molluscs occurring in the Nile Valley without finding any developmental form which might have been brought into relation with the Bilharzia worm."

The present enquiry was carried out chiefly at El Marg, a village of about 5,000 inhabitants, some nine miles north of Cairo, supplied with water by a small tertiary canal which traverses the village and derives its supply from the main Ismailia Canal a few miles distant. The surroundings of the village are shown by a map and there are numerous photographs of the canal, showing women washing their clothes in it, children fetching water, etc. A rapid examination of the urine of 54 boys in the schools of the village showed bilharzia eggs in 49 cases. It seemed reasonable to suppose that the infection was derived from the Marg canal. A complete census of fresh-water Mollusca in this water was, therefore, made and it was possible to ensure its completeness because the main canal is controlled by the Government, which supplies water for only six consecutive days in every three weeks. A list is given of the species of molluscs collected. These were separated into their different genera and examined for developmental stages by direct inspection or by dissection. When an infected mollusc is kept in a glass vessel in clean water for a few days cercarial forms are frequently discharged and may be seen swimming about in the water if the glass is held against the light and examined with a hand lens. By dissection, the earlier stages are obtained. The technique is detailed. Over 3,300 samples were minutely examined, and 17 specimens of Trematode larvae were identified. A list is given.

It is pointed out that the absence of pharynx in the cercaria is the one reliable character by which a bilharzia cercaria can be distinguished from that of other distomes. Looss stated that none of the Egyptian mollusca exhibited the slightest attraction for the freshly hatched miracidia of bilharzia. In the author's experience a definite attraction was exhibited by four species of mollusca. Large numbers of snails collected from the Marg Canal were infected with larval forms showing the morphological peculiarities of the bilharzia group. Three cercariae of this type were found in four different species of mollusc. Two of these, species of *Bullinus* and *Planorbis*, are figured. Attempts were made to infect animals with the cercariae—variegated mice and white rats brought from London. These were successfully infected as well as the Egyptian desert rat, guinea-pigs and Mangabey monkeys.

A number of these animals were submitted to infection shortly before departure for England; all when examined in London had enormous numbers of bilharzia worms in the portal system, as is shown in figures.

Looss and others have shown that miracidia are killed immediately by a dilution of 1 in 2,000 of hydrochloric acid. The author found that the cercariae withstood hydrochloric acid 1 : 808 for five minutes. An experiment showed, however, that monkeys could be infected through the mouth. Of four sooty monkeys three were subjected to infection through the skin and one was caused to drink from a cup containing water swarming with bilharzia cercariae. The four monkeys died and all showed a heavy infection with bilharzia, the monkey infected from drinking water having more intense symptoms than the rest. The author believes, however, that the infection enters through the skin in the bulk of cases.

With regard to the incubation period, it is probably from one to two months. One argument brought forward by Looss in favour of his theory was that the disease occurs among children born and bred in large towns such as Cairo, where there is a filtered water supply. The author found that in addition to the series of pipes supplying Cairo with filtered water there is a second system bringing unfiltered water drawn directly from the Nile. This would account for the infection of Cairo children. The table on the following page shows the conclusions based on the Looss hypothesis and those based on the results of the present enquiry.

Part II. deals with prevention and eradication, and firstly with water in relation to the spread of bilharzia. It is pointed out that there are certain physical conditions almost peculiar to Egypt which are inimical to the cercaria and its carrier, "which, if properly exploited, might bring about almost complete eradication of the disease in the course of a few years." These depend on the facts that water is absolutely essential to bilharzia outside the body and that practically all water in Egypt comes from the Nile. (The rainfall at Cairo is only 3·28 centimetres per annum). It is noted that the whole of Lower Egypt under cultivation is irrigated from canals which run throughout the year, and that over 900,000 acres in Upper Egypt are also perennially irrigated, irrigation elsewhere depending on the annual rise of the Nile. The extension of perennial irrigation appears to have encouraged the spread of the disease, as Milton has pointed out.

Coming to protective measures Col. Leiper divides the life of the bilharzia outside the body into three stages [which may be termed premolluscan, molluscan and postmolluscan] and points out that in large towns a simple means of destroying the free-swimming infective stage [post-molluscan] must be found, whereas in the country villages and districts the worm must be deprived of the essential intermediate host. The prevention of bilharziasis in towns is then considered. Here, as stated above, children acquire the disease from the public supply of unfiltered water. The ideal remedy, to do away with this, seems impracticable. It has been found, however, that it is impossible to keep the cercariae alive more than 36 hours; hence storage for a day and a half would meet the case. The water would have lost its valuable sediment but, on the other hand, under the present system about ten thousand children in Cairo become infected

annually. The origin of this bilharzial infection is discussed. It is shown with the aid of a map that whereas in the Delta water used for irrigation does not return to the Nile, above Cairo it does and, taking into account the velocity of the river at different seasons and the maximum life duration of the cercaria, it is pointed out that the Nile at Cairo, and hence the unfiltered water supply, should be infective chiefly during the autumn.

CONCLUSIONS CONTRASTED.

"Conclusions based on the Looss Hypothesis.	"Conclusions based on the Results of the Present Inquiry.
"1. All transient collections of water, such as those resulting from occasional showers of rain, road waterings and domestic waste, are dangerous if freshly contaminated.	"1. Transient collections of water are quite safe after recent contamination.
"2. Large bodies of water, such as the Nile, canals, marshes and birkets, are little liable to be infective.	"2. All permanent collections of water, such as the Nile, canals, marshes and birkets, are potentially dangerous, depending upon the presence of the essential intermediary host.
"3. All water in a given area would automatically become safe in thirty hours if the native infected population were removed.	"3. The removal of infected persons from a given area would have no effect, at least for some months, in reducing the liability to infection, as the intermediate hosts discharge infective agents for a prolonged period.
"4. Infected troops would be liable to reinfect themselves, to spread the disease among other troops, and to convey the disease to any part of the world.	"4. Infected troops cannot reinfect themselves or spread the disease directly to others. They could only convey the disease to those parts of the world where a local mollusc could efficiently act as carrier.
"5. Infection only takes place through the skin.	"5. Infection actually takes place both by the mouth and through the skin. Recently contaminated moist earth or water is not infective.
"6. Infection in towns is due to contact with recently contaminated moist earth or water.	"6. Infection in towns is acquired from unfiltered water which is still supplied, even in Cairo, in addition to filtered water, and is delivered by a separate system of pipes.
"7. Eradication depends upon education and complete sanitary control throughout the country. The sustained co-operation of the affected individual is essential."	"7. Eradication can be effected without the co-operation of infected individuals by destroying the molluscan intermediaries."

The next section deals with infection in the maritime canal zone, of special interest at the present time. Ismailia, Suez and Port Said are supplied by the sweet water canal which leaves the Nile north of Cairo. Its length and the velocity of its contents are such that infection entering at the head would have died out before reaching Ismailia. In the portion near the maritime canal there is much weed and specimens, uninfected, of *Bullinus* were found. Examination of the children at the schools at Port Said and Suez showed that the water is but lightly infected. The native population at Ismailia, among which there is "a fair amount of bilharzia," appear to derive their infection from the marshes, where infected *Planorbis boissyi* were found; these can be dealt with adequately only by filling.

Prevention in agricultural districts depends on the Government control of the Nile water. Where irrigation is perennial the water is not allowed always to run; during the summer months, April to August, the head regulators are periodically closed, six days supply being followed by fifteen days cessation. Leiper's proposals for eradication are based on his study of the problem in the Marg district. The Marg canal became dry during the 15 days stoppage and Planorbis and Bullinus taken from the dry bottom did not revive when placed in water. Had the alignment of this canal been more correct there would have been no puddles to act as a "carry over," and the rotation itself would have killed the molluscs "just at the commencement of their annual reproductive activity." The same object might be attained by the provision of an alternative route for the rotation water from the secondary canal to the fields, or by treatment of the puddles with chemical agents such as ammonium sulphate. The periodical clearing of the small open drains must be regarded as an essential part of any scheme till closed drains are adopted. The campaign would be in progress from April to August. Leiper goes on to consider the state of the crops during those months and concludes that during June and July two-thirds of the land is in fallow, the remaining third being under cotton. These are also the months in which evaporation is at its height, as is shown by a chart. It should be possible, he thinks, to use only a third of the tertiary canals during these months, the others and the drains supplied by them becoming desiccated.

The subject of reclamation is then considered and, finally, the protection of the troops, and personal prophylaxis. These necessitate a study of the bionomics of the cercariae. A mouse became infected after ten minutes immersion, which shows that the skin can be pierced very rapidly. No cercariae survive 48 hours in tap water. On the other hand "they cannot withstand the slightest desiccation." They need oxygen and they are killed if the temperature is momentarily raised to 50° C. Experiments were undertaken in which the cercariae were subjected to the action of acids, acid salts, essential oils and antiseptics. The results are set out in tabular form. It is seen that 1 : 1000 sodium bisulphate kills them "almost immediately." The practical conclusions are :—

"That unfiltered water taken from canals, ditches, or birkets would be rendered safe :—

"(1) If kept beyond the survival period of the cercaria, i.e., for forty-eight hours.

"(2) If heated to 50° C., a temperature at which the cercaria is immediately killed.

"(3) If previously treated with those chemicals that are lethal to the cercaria."

The use of "tabloids" of sodium bisulphate, 16 grains to a pint of water, giving a dilution of 1 in 567, is recommended.

The following points should be attended to:—

"(1) Personal contact of any kind with unfiltered water is risky. The surface of the water is the most likely to be infective as the cercariae congregate there. An intake pipe should always be led therefore to the centre of the stream and should draw the water from near the bottom and at a place where there is little or no vegetation.

"(2) It is essential in drawing water for storage, in order to destroy the bilharzia cercaria, that no infective mollusc be admitted. This can be ensured by screening the intake pipe with gauze having about sixteen meshes to the linear inch. The common mosquito gauze or phosphor-bronze wire gauze is very serviceable.

"(3) The water in the wells and 'sakias' may be regarded as much safer than that from other sources. Hitherto molluscs have not been found in these wells.

"(4) Shallow barrel sand-filters are open to suspicion. It has been found experimentally that after fifteen minutes cercaria succeed in passing in large and increasing numbers through four inches of desert sand.

"(5) Although the reproductive activity of bilharzia in the molluscs is probably most intense during the summer months the occurrence of mature cercariae in infected molluscs in February shows that there is a certain liability to the infection throughout the year."

The report, the value of which it is superfluous to indicate, is illustrated by good and instructive photographs. The Bibliography, which is one hopes exhaustive, comprises 532 references. With the account of the concluding portion, not yet appeared, it is hoped to reproduce some of the illustrations.

A. G. B.

AMOEBIASIS AND DYSENTERY.

Amoebiasis.

Christie (W. Ledingham). **Further Investigations into Latent Dysentery and Intestinal Parasitism in Sarawak, Borneo.**—*Brit. Med. Jl.* 1915. July 17. pp. 89–90.

The author, writing from Sarawak, gives the results of an examination of the faeces of 100 Malay men, women and children without any reference to present or past illnesses. Four slides from each sample were examined and amoebae were chiefly searched for. Only moving specimens or those well stained by neutral red were counted. "They had the eccentric nucleus, blunt pseudopodia and other characters of *A. histolytica*." The investigation yielded the following results: *Amoeba histolytica* was found in 59 per cent. of the samples, *Ankylostoma duodenale* in 59 per cent., monads in 66 per cent. (*Trichomonas* 63 per cent., *Cercomonas* 3 per cent.), roundworms (*Ascaris lumbricoides*) in 79 per cent., whipworm (*Trichocephalus dispar*) in 84 per cent.; 17 per cent. of persons were harbouring several sorts of parasites at the same time. On enquiry, it was ascertained that of those in whom amoebae had been found 34 could remember having had dysentery, 26 could not, while of the negative cases 10 had had dysentery and 13 had not. The writer gives notes of a series of cases, showing that persons who were harbouring apparently non-pathogenic amoebae, contracted later an acute dysentery due to amoebae of similar appearance.

The writer concludes that amoebic dysentery is endemic among Malays of the Sarawak River; that some immunity seems to exist against very severe attacks or epidemics; but that an educational and remedial campaign would be beneficial.

Ordinary hygienic cleanliness and care, with freedom from intimate association with natives, will usually protect Europeans from danger of death from amoebic dysentery.

J. C. G. Ledingham.

Garrett (F. D.). **Amoebic Infection.**—*Texas State Jl. Med.* 1915. May. Vol. 11. No. 1. pp. 32–36. With 3 text-figs.

Amoebiasis is prevalent in the great seaports such as Galveston, New Orleans, San Francisco and Baltimore, but it appears to be increasing among the natives in the interior especially in the south. No doubt the opening of the Panama Canal will increase the number of carriers of this disease in Texas unless proper precautions are taken. The paper contains notes on diagnosis of the various amoebae, clinical symptoms and pathological lesions, etc. With regard to emetine he says that to prevent recurrence from encysted amoebae in the tissues it is best to give emetine in full doses and quinine enemas three days in every fourteen for at least two months after the first three weeks of intensive treatment have been completed. It would be wise also to examine the stools at intervals for a year after the patient is apparently well.

J. C. G. L.

i. Corlette (C. E.). **Amoebic Dysentery and Abscess of Liver: An Indigenous New South Wales Case.**—*Med. Jl. of Australia.* 1915. May 8. Vol. 1. 2nd Year. No. 19. pp. 427–428.

ii. Jeffrey (Eric). **A Case of Endemic Tropical Dysentery.**—*Ibid.* June 5. No. 23. p. 532.

i. The case is reported for its epidemiological rather than for its clinical interest. The patient had never been out of New South Wales. Amoebae were present in the pus of the abscess and also in the faeces. Records of at least six other similar cases in past years in New South Wales are cited. All have been males. The writer thinks it is probable that there have been many privately observed cases of amoebic dysentery and amoebic liver abscess in New South Wales and other parts of Australia, which have not been recorded in the literature. He raises the point whether mines may not become so infected as to constitute endemic centres of amoebic dysentery, as may be the case in ankylostoma.

ii. This case occurred in a native of New South Wales, who had never left Australia and had not even visited Queensland. Amoebae resembling *E. histolytica* were present in the stools.

J. C. G. L.

Chalmers (Albert J.) & Archibald (R. G.). **The Cure of Amoebic Dysentery.**—*Jl. Trop. Med. & Hyg.* 1915. Aug. 16. Vol. 18. No. 16. pp. 181–183. With 1 plate.

The authors draw attention to the importance of diagnosing cryptic amoebic infections and of ascertaining when it is safe to say that an actual cure has been realised. Sometimes lesions are limited to the caecum and ascending colon and this carrier or cryptic condition may last for many months or years. Another form of latency is that simulating appendicitis, accompanied by pain in the right iliac fossa together with a sense of resistance or of thickening in that region. This may, in the authors' experience, be accompanied by mild febrile attacks. Mild anaemias have also been associated with amoebic infections. They have seen a case of latency without noticeable diarrhoeal attacks, which must have lasted three years or more. A *differential leucocyte count* is, in the authors' opinion, the only quick and ready means for the diagnosis of latency. There is an increase of the mononuclear leucocytes without distinct evidence of malarial or other protozoal infection. The diagnosis of cure can be definitely ascertained only by repeated differential counts. A differential count should be made before the emetin treatment and again after the amoebae have disappeared from the faeces. As a rule, after the amoebae have disappeared the mononuclear count remains high or may increase. The treatment is now stopped for about a fortnight when the count is again made. If signs of discomfort over the caecum and ascending colon appear, emetin is repeated for a few days. In this way, the intervals of non-treatment are lengthened and the intervals of treatment are shortened until the mononuclear count returns to normal or nearly normal. In cases treated with emetin, there is also an increase of the eosinophiles. This eosinophilia disappears with the cure of the amoebiasis and the cessation of the emetin treatment.

It is the authors' practice now to make a differential count on any person who shows anaemia of non-malarial or non-kala-azar origin or who has any peculiar intestinal, urinary, pulmonary or joint affection.

If there is a marked mononuclear increase not explicable by malaria, a purge is given and the motions examined for amoebae on more than one occasion.

The paper contains a plate showing unstained preparations of *L. tetragena* and cysts.

J. C. G. L.

SCHWALB (Johannes). **Beitrag zur Behandlung der Amöbendysenterie mit intravenösen Emetininjektionen.** [The Treatment of Amoebic Dysentery with Intravenous Injections of Emetin.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1915. Mar. Vol. 19. No. 5. pp. 147–148.

Two physicians, who accidentally infected themselves with the pus of a liver abscess, contracted amoebic dysentery. The patients came under observation on the first day of the disease. Each received on the first two days 100 mg. emetin in 150 cc. inoculated intravenously. On the 5th and 9th days of the disease each got a further dose of 60 mg. in 100 cc. saline. Amoebae were still present in the stools on the 14th and 10th days respectively, and accordingly a final course of intravenous emetin injections was undertaken.

Both patients were apparently well at a date four months after the end of the treatment. There was no local reaction and no fever, no vomiting or faintness. Merck's emetin hydrochloride was used. The solutions in saline were made up before use and sterilised in the steamer for 20 minutes.

J. C. G. L.

CHALMERS (Albert J.) & PAPATHEODOROU (Dimitri). **The Administration of Emetine during Pregnancy and Menstruation.**—*Jl. Trop. Med. & Hyg.* 1915. July 15. Vol. 18. No. 14. pp. 159–160.

The authors commence by stating that according to the pharmacologists ipecacuanha has a direct effect on the uterus, increasing its contractions, and that therefore its administration in large doses in pregnancy should be avoided. On the other hand there is a published record of the administration in $\frac{1}{2}$ grain doses daily of emetin to a woman in the sixth month of pregnancy suffering from amoebic dysentery. There was no ill effect. The authors were called upon to treat a woman in the third month of pregnancy and decided that emetin was not contraindicated, as it would certainly relieve the dysenteric attack which *per se* might cause a miscarriage. An injection of 4 cg. of emetin was given intramuscularly and 16 hours later the patient complained of severe pain on the right side of the pelvis. Another dose of 4 cg. was given and three hours thereafter she complained of strong pains in the uterus. The uterus could be easily felt but nothing abnormal was detected. Small doses of Tinct. opii and, later, a hypodermic injection of morphine and atropine were given but none of these relieved the pains. Thirty-six hours after the first injection the pains ceased and it was decided to give no more emetin. The woman speedily recovered from her dysentery and the pregnancy was apparently unaffected. In another case, menstruation appeared

during the emetin treatment ($\frac{1}{2}$ gr. doses daily) but suddenly ceased on the second day of the period though the injections were stopped. Two subsequent periods were perfectly normal.

They decide that $\frac{1}{2}$ gr. (about 3 cg.) is the maximum daily dose which can be given safely in pregnancy and that the effect of the doses should be carefully watched. It is not advisable to give emetin during the menstrual period but, if urgently required, it can be given without causing serious harm and can be continued in the intermenstrual period.

J. C. G. L.

LYONS (Randolph). **Mode of Action and Use of Emetin in Entamoebiasis.**—*Amer. Jl. Med. Sci.* 1915. July. Vol. 150. No. 1. pp. 97–109.

The chief points to which attention is drawn are the following:—Entamoebas free in the lumen of the gut are apparently not affected by emetin or ipecac given orally or subcutaneously. It is not definitely known how or in what form ipecac and emetin are eliminated from the body, but there is some experimental evidence that the amoebicidal principles of ipecac when taken by the mouth are not eliminated in the faeces. The failure of emetin given hypodermically to destroy *Entamoeba coli* argues against the elimination of the drug from the circulation by way of the large intestine. Relapses are due to the survival of some of the entamoebas probably through encystment. In the carrier state the entamoebas are probably simply harboured in the lumen of the gut in the same manner as *E. coli*, thereby causing no symptoms. The intestinal mucosa is in some way protected against the penetration of the organism.

Emetin is best given hypodermically and in severe cases intravenously. Oral administration is not advisable owing to the resulting intestinal irritation. The whole drug is preferable for this route; in an ordinary case of amoebic dysentery an average of 1 gm. daily or less is sufficient. The duration of the treatment is from 1–2 weeks. Too large doses or too prolonged use of moderate doses may cause a diarrhoea or be responsible for its persistence. In order to prevent relapse, an intermediate form of treatment should be instituted in every case, even though cysts are not found.

Emetin subcutaneously or locally has been shown to be practically specific in pyorrhoea alveolaris. Its use in haemorrhagic conditions is entirely empirical and its value is questionable.

J. C. G. L.

DUMEZ (A. G.). **Two Compounds of Emetine which may be of Service in the Treatment of Entamoebiasis.**—*Philippine Jl. Sci.* Sect. B. Trop. Med. 1915. Jan. Vol. 10. No. 1. pp. 73–79.

Although emetin has given good results in the treatment of amoebiasis, there is still room for improvement. The author introduces two new compounds, viz., emetine mercuric iodide and emetine bismuthous iodide. The method of preparing them is detailed. Both are insoluble in water or in water acidulated with HCl. No clinical evidence is yet available as to their usefulness. It is possible

however, from experiments carried out on dogs, that these two compounds may be capable of administration in large and frequent doses and may permit of the emetine coming in contact for a longer period with the entamoebae it is calculated to destroy.

J. C. G. L.

SNELL (John A.). **Death of Child probably due to Emetin.**—*China Med. Jl.* 1915. May. Vol. 29. No. 3. pp. 164–167.

Female child of five years in whose stools amoebae were found. Emetin, $\frac{1}{3}$ gr., was given intravenously on November 5th.

For the next five days $\frac{1}{2}$ gr. was given daily subcutaneously. On the 11th $\frac{2}{3}$ gr. was given and during the next three days 1 gr. was given daily. On the 14th there was only one stool which was normal and the child seemed well. On the 15th the child had slight photophobia. On the 17th the mouth was ulcerated and the gums swollen and on the following day there was a slight rash on the legs. On the 19th the stools again contained mucus and emetin was again given ($\frac{1}{2}$ gr. on 19th and 1 gr. on 20th). The stools contained blood and mucus. On the 21st there were only three motions and $\frac{2}{3}$ gr was given. Photophobia became more marked and the child was becoming weak. On the 22nd $\frac{2}{3}$ gr. was given. Rash appeared over entire body and the lips and gums were swollen. On the 24th there was considerable difficulty in swallowing. The breath was very foul and the abdomen was slightly tender on deep pressure. The stools (3–5 per day) contained some bright red blood and mucus. $\frac{1}{3}$ gr. of emetin was given and repeated on the 25th. By this time the rash had become confluent on the face and the mouth symptoms worse. It was decided that possibly there was emetin poisoning and no more was given. On the following days, the condition of the mouth, throat and tongue considerably improved but the ability to swallow became progressively worse. It was concluded that a partial palsy of the muscles of deglutition existed. The child died on the 28th. *There was no autopsy.* In all the child received $10\frac{2}{3}$ gr. over a period of 21 days.

In an editorial article on this case the feeling is expressed that the case is "not proven." The absence of an autopsy is unfortunate. Peripheral neuritis is not uncommon as a complication of dysentery and "our natural feeling is one of wonder whether the dosage of $10\frac{2}{3}$ gr. spread over 21 days was the main factor in causing the death of the child."

J. C. G. L.

ACHARD (Ch.) & FOX (Ch.). **Deux Cas d'Amibiase Hépatique en Foyers disséminés avec Cirrhose Hypertrophique.**—*Arch. de Méd. Experim. et d'Anat. Path.* 1914. July. Vol. 26. No. 4. pp. 345–365. With 3 figs.

Record of two cases of cirrhosis of the liver associated with miliary necrotic nodules, which proved after bacteriological examination to be of amoebic origin. The patients had returned to France after 13 years' and 10 years' sojourn in the tropics and during the following 7 years and 18 years respectively, they had enjoyed good health. Both had suffered from malaria. Symptoms of hypertrophic cirrhosis intervened in each case and death took place, in the one from pulmonary gangrene with terminal haemoptysis and in the other from haematemesis. At autopsy, the lesions were identical. The liver was large with irregular contour and studded on the surface with nodular masses, the intervening depressions revealing advanced cirrhosis.

On section the organ was hard and showed numerous sulphur-yellow nodules easily enucleated and easily crushed by the finger. Each nodule was surrounded by a sclerotic zone. The spleen was enlarged, but there was no ascites. Histological examination of a nodule from within outwards showed (1) a central portion consisting of amorphous granular matter, (2) an intermediate zone formed by embryonic connective tissue and infiltrated with leucocytes (pyogenic membrane), and (3) a peripheral hyperaemic zone formed by enlarged liver trabeculae. The capillaries of this latter area were congested and the intertrabecular spaces were infiltrated with leucocytes. In the dilated capillaries and in the interstices of the connective tissue, were amoebae, badly stained for the most part, some with retracted and more or less vacuolated protoplasm and others in the encysted state with multiple nuclei. Some of them contained red cells by the side of the empty vacuoles. The nuclei stained well with haematin and occupied an eccentric position. (The authors note that the preparations were seen by Dopter, who gave it as his opinion that the elements in question were amoebae).

The insular cirrhosis, of which a detailed histological report is supplied, was probably due to malarial as well as to amoebic infection.

J. C. G. L.

Rogers (Leonard). **Pyorrhoea alveolaris as a Streptococcal and Amoebic Disease, and its Treatment by Vaccine and Emetine.**—*Indian Med. Gaz.* 1915. Apr. Vol. 50. No. 4. p. 121.

The author remarks on the great frequency of pyorrhea alveolaris in the tropics, and the resistance of the disease to treatment. It may be associated with impairment of the health of the patient, "such as indigestion, sprue-like diarrhoea and anaemia." From a case of chronic sprue "accompanied by very advanced pyorrhoea alveolaris with looseness of all the teeth, . . . a nearly pure culture of streptococci [was obtained] from the pus, and the condition was completely cured in a few weeks by injections of an autogenous streptococcus vaccine and emetine." Similar cases have been encountered since. Cultures on glycerine agar have nearly always shown almost pure cultures of streptococci, "but in one with small gumboils a mixed strepto- and staphylococci were obtained." In each case autogenous vaccines were prepared, with satisfactory results.

The initial dose of the streptococcal vaccines was usually fifty million, and a week later one hundred million, repeating at weekly intervals as long as necessary.

"Out of seven successive cases which have been under observation for upwards of a month, four were completely cured after receiving from four to six injections. One improved greatly but relapsed, and amoebae were then found in the pus. One patient attended very irregularly and received only three doses in the course of two months, with but slight improvement, the treatment not having been given a fair chance. The remaining case was a very bad one with tender gums and severe and very frequent attacks of facial neuralgia. He has had eight injections of the vaccine, and is very much better, although still not quite cured. After three injections the neuralgia disappeared, and has not recurred. The sprue patient has remained well for fifteen months, but in the other cases only two or three

months have elapsed, so it is too early to say if the recovery will be permanent. The above results are, therefore, very satisfactory in such an obstinate affection. Several other cases are making good improvement after only two or three weeks treatment."

The author also found amoebae in pyorrhoea alveolaris. Numerous active amoebae were found in a very chronic case of the disease. On the day following the subcutaneous injection of one grain of emetine only a few sluggish amoebae were found. After a second dose of emetine they had disappeared from the pus and the gums showed slight improvement. After four bi-weekly injections of emetine, copious pus was still present although no amoebae could be found, and vaccine is being tried.

"Probably a combination of vaccines and emetine will be the best treatment of this obstinate disease, and promises to be effective, even in severe cases which have resisted all local treatment."

H. B. Fantham.

SMITH (Allen J.) & BARRETT (M. T.). **The Parasite of Oral Endamebiasis, *Endameba gingivalis* (Gros.).**—*Jl. Parasit.* 1915. June. Vol. 1. No. 4. pp. 159–174. With 1 plate.

The pathogenic importance of the endamoebae of the human mouth has been recently advanced by the present authors and others [see this *Bulletin*, Vol. 6, pp. 55–57.] The parasites are regarded as "either directly causative of a large class of gingival and alveolar pyorrheas or as important members of a symbiotic chain with one or other of the numerous associated vegetable micro-organisms, in the production of these lesions." . . . "Proof of the pathogenic importance of the endamebae in Riggs' disease rests upon their almost constant presence in the suppurating pockets of pyorrhea, and the prompt removal of both suppuration and of the endamebae when emetin, a proved amebicide but of low bactericidal value, is administered locally or generally." Such cases should be termed endamoebic pyorrhoea. Certain systemic complications may be connected with the presence of oral endamoebae.

The main part of the paper consists of an endeavour to coordinate the various amoeboid organisms described as being parasitic in the human mouth. It is considered that *Amoeba gingivalis* Gros, 1849; *Amoeba buccalis* Steinberg, 1862; *Amoeba dentalis* Grassi, 1879; and *Entamoeba buccalis* Prowazek, 1904 are synonymous. The scattered literature relating to these various organisms has been carefully consulted, and useful extracts are given therefrom. It is concluded that the correct name for these parasites is *Endamoeba gingivalis* Gros, 1849. The authors adopt the spelling Endamoeba of Leidy, 1879, in preference to that of Entamoeba, Casagrandi and Barbagallo, 1897. The work of CHIAVARO (1914) on these parasitic oral amoebae, done in the laboratory of GRASSI, is mentioned. His conclusions, which preceded but agree with those of the present authors as to synonymy, are quoted.

A description of *Endamoeba gingivalis* is given. Its usual diameter is said to be 30μ to 35μ, with refractile and faintly greenish hyaline ectoplasm and slightly granular endoplasm. The latter may contain digestion-vacuoles in which globular detritus of leucocytic nuclei and

red blood cells may occur, together with bacteria. The nucleus is round and almost invisible in life. It is often near the centre of the organism and it measures 2μ to 5μ across. It is vesicular, with a karyosome. The nuclear membrane is thin. The pseudopodia are few, usually lobose and composed almost entirely of ectoplasm. Binary fission was seen and also cysts.

Entamoeba kartulisi, observed in the pus of abscesses of the lower jaw, is considered to be *E. gingivalis*. The oral parasite known as *Entamoeba pyogenes* Verdun and Bruyant, 1907, is also considered. It is thought to be different from *E. gingivalis*. *Endamoeba mortinatalium* [see this *Bulletin*, Vol. 5, p. 209] and its possible identity with amoebae found by TIETZE and by RIBBERT in the parotid glands is noted. [These organisms may possibly be forms of *E. gingivalis*.]

In conclusion, the morphological similarity of *E. gingivalis* and *E. histolytica* is briefly discussed. The authors state that they "are unwilling to make any assertion which involves biological identity in full, merely asserting that the morphological similarity is so close that [they] feel unable to make a distinction from microscopic observation alone." It is stated that *E. gingivalis* does not form "reproduction cysts."

An interesting plate illustrates the paper. It contains reproductions of some of the figures of the earlier observers. [It is to be regretted that the plate is crowded and that, in consequence, some of the figures are much reduced, so that some necessary details are hardly discernible.]

H. B. F.

MARSHALL (D. G.). **Primary Malignant Adenoma of the Liver simulating Tropical Abscess.**—*Edinburgh Med. Jl.* 1915. July. New Ser. Vol. 15. No. 1. pp. 29–31. With 1 plate.

The patient (34 years of age) had been in Rhodesia for some years. There was no leucocytosis but a slight increase in the large mononuclears. Examination of stools for amoebae and ova was negative. No history of dysentery. At the laparotomy the surface of the liver was found to be irregularly nodular and an excised portion showed a rapidly growing malignant adenoma. As the writer remarks: "It is advisable in doubtful cases to bear in mind that patients from the tropics presenting signs of affection of the liver may be suffering from diseases not necessarily limited to the tropics."

J. C. G. L.

BACILLARY DYSENTERY.

SACQUÉPÉE, BURNET & WEISSENBACH. **Recherches sur les Diarrhées et la Dysenterie des Armées en Campagne.**—*Paris Méd.* 1915. July 24. Vol. 5. Nos. 11–12. pp. 200–203.

This paper contains brief notes of the various clinical types of diarrhoea and dysentery met with in the field (French 4th Army) and the bacteria associated therewith. The types are thus classified:—

1. In the great majority of the cases (about two-thirds) the diarrhoea was of a simple character. The stools were fluid and never contained blood or mucus. Under healthy sanitary conditions the diarrhoea disappeared in a day or two. Only a change of regime was necessary.

2. A form of mucous diarrhoea more serious than the first and lasting one to three weeks, yielding only with difficulty to various treatments. Sometimes a cachectic state supervened. The stools were fluid and contained flakes of mucus.

3. Cases showing the typical dysenteric syndrome with tenesmus and blood and slime in the motions. The majority of these ran a mild course yielding either to specific (serum therapy) or to non-specific remedies. There were two very grave cases, one due to *B. Flexner* being saved by massive intravenous injections of serum, the other (fatal) being a mixed infection with *B. para.* (B) and *B. dysenteriae.*

4. Choleraic forms with vomiting, and frequent fluid stools containing no mucus or blood. Pulse was rapid and the other symptoms were those of severe intoxication.

Of types I and II there were altogether 115 cases, of type III 20 cases and of type IV 3 cases. Bacteriological investigations in Group I yielded *B. dysenteriae* (Y) in 8 cases, *B. dysenteriae* (Type W) in 5 cases, *B. typhosus* in 2 cases, *B. para.* (A) in one case and the *Enterococcus* in 5 cases.

In Group III *B. dysenteriae* (Flexner) was recovered from one case, *B. dysenteriae* (Y) from 7 cases, *B. dysenteriae* (W) from 6 cases, and *B. para.* (B) from one case. In one case there was a mixed infection with *B. para.* (B) and *B. dysenteriae* (W).

In Group IV. *B. para.* (B) was recovered from the blood in one case. In another streptococci were recovered from the blood and organs at autopsy while in the third, spirilla differing from *V. cholerae* in cultural and biological properties were found in the dejecta.

B. dysenteriae (Shiga) was never found.

[The special features of the type "W," which the authors consider to be new, are not mentioned.]

With regard to the factors predisposing to dysentery outbreaks the authors specially refer to difficulties of transport especially of foodstuffs, pollution of drinking water supplies, the effect of "cadaverism"—inhalation of noxious gases from dead men and beasts lying in the immediate vicinity of the trenches, the monotony of meat diet leading to digestive troubles, cold, etc. All of these factors are capable of reasonable elimination by improved sanitary measures. *In severe cases of dysentery the use of specific serum therapy should never be neglected.*

J. C. G. L.

STRAUSS (H.). **Zur Aetiologie der Dysenterie und dysenterieähnlicher Erkrankungen.** [On the Etiology of Dysentery and Allied Conditions.]—*Arch. f. Verdauungskr.* 1915. Feb. 15. Vol. 21. No. 1. pp. 16–22.

In war time it is of great importance that the etiological factor in any particular form of "dysentery" should be known at the earliest possible moment, as the appropriate therapy and prophylaxis depend so greatly on this knowledge. The bacteriological examination should be undertaken as soon as possible after the stool is passed. In spite of this precaution, however, the causative bacilli are not seldom missed.

The writer had previously recorded three cases of clinical dysentery in which neither dysentery nor paratyphoid bacilli were recovered from the stools, but in which agglutination of *B. dysenteriae Y* and also *B. paratyphosus* by the patients' sera occurred [? A or B.]. This line of research he has continued in a subsequent series of eight cases, four of which were clinically dysentery and four only suspects. In one only of these cases was *B. dysenteriae* (Flexner) recovered from the stools. Four of the eight cases agglutinated *B. Shiga* and *B. Flexner Y* in 1 in 100 or over, while two agglutinated *Bac. Y.* only. Two agglutinated paratyphoid bacilli only. He draws the conclusion from these findings that a form of acute haemorrhagic colitis due to the paratyphoid bacillus is not uncommon. [This may be true but is entirely unwarranted from the evidence.] In peace time he had observed paratyphoid infection to take the form of a pure colitis rather than that of the usual gastroenteritis paratyphosa.

Soldiers invalided for dysenteric affections should be very carefully treated and supervised before being allowed to return to service, as the tendency to relapse is always present. In cases in which the aetiological factor has not been ascertained by bacteriological examination it is worthy of consideration whether dysentery as diagnosed by serological tests should or should not be notified. The etiology of the chronic forms of "dysentery" or colitis gravis has always been a vexed question. The writer was able to recover *B. para.* (B) from the rectal ulcers of a case of chronic haemorrhagic colitis. He also tested the sera of seven cases of chronic haemorrhagic colitis against dysentery and paratyphoid bacilli. All of the cases presented the clinical picture of colitis gravis, with slow onset, shorter or longer intermissions and either continual or periodic evacuations containing blood or blood and pus. None of these cases began as an acute dysentery. One case agglutinated *Bac. Y* in 1 in 100, two agglutinated *B. Shiga* in 1 in 50 to 1 in 150, while one agglutinated *B. typhosus* in 1 in 100. In none of the cases was the corresponding organism recovered from the faeces. The author thinks however that dysentery bacilli and paratyphoid bacilli may be important etiologically in these cases and he recommends further study of such cases from this point of view.

[It is most important that the test strains used in such work should be thoroughly tested with sera of normal persons and also that the technique should be uniform and stated precisely.]

J. C. G. L.

SINGER (Gustav). **Ueber Dysenterie.**—*Militärarzt.* 1914. Nov. Vol. 48. No. 26. pp. 490–495.

Clinical lecture on dysentery, delivered 24th September, 1914. A specimen of the large bowel from a fatal case of dysentery in a soldier was demonstrated and attention was drawn to the great thickening of the muscular wall. This hypertrophy of the muscular coat may develop very quickly. Only certain points require reference. Rheumatism of the muscles and joints is an important complication and occurs in 5 per cent. of all cases. Metastatic affections of the eye may occur, as conjunctivitis and iritis, and also liver abscesses, which are not solitary as in amoebiasis but small and confluent. Cases due to the atoxic strains [Mannite-fermenters] give, as a rule, a good

prognosis. Serum treatment is indicated only in cases due to the toxin-producing races ("Shiga" type) where it is of great value. [This is not strictly accurate as serum therapy has proved useful in severe infections due to "Flexner" strains.] Bowel washes are of great value as they effect the removal of masses of exudate, mucus, blood clots, pus and necrotic masses. In the early stages washes of saline are indicated and in the later stages disinfectant washes containing Pot. permanganate, thymol, salicylic acid, protargol (1/4–1/2 per mille), tannin, etc. Opium should be used very sparely. Like many other writers, the author strongly recommends the use of bolus alba and animal charcoal (daily 3–4 table spoonfuls of each suspended in water). Simaruba in combination with pomegranate root has a favourable influence on the tenesmus and colic. Dietetic therapy is of prime importance and milk with lime water, or Kefir and Yoghurt deserve mention. Chronic cases occur not infrequently and are often diagnosed as severe ulcerative colitis. The author believes they are generally dysenteric in origin but proof from the bacteriological or serological side is difficult. The rectoscope is required to reveal the condition, which may be treated by caustics or insufflation. Protracted cases often yield to appendicostomy or colostomy followed by washing of the bowel.

J. C. G. L.

von MUELLER-DEHAN (Albert). **Beobachtungen zur Klinik und Therapie der Dysenterie, insbesondere der postdysenterischen und postulzerösen Polyneuritis.** [Notes on the Symptoms and Treatment of Dysentery especially of Post-Dysenteric Polyneuritis.]—*Wien. Med. Woch.* 1915. Apr. 17. Vol. 65. No. 16. pp. 654–659.

A clinical lecture on dysentery, embodying the writer's experiences in August and September 1914. The dysentery was purely bacillary, both Shiga and Flexner types being met with. Inagglutinable strains of Shiga were occasionally found, also atypical Flexner strains. It was very notable that in many clinically typical cases the bacteriological findings were negative. This may have been due to many causes, e.g. press of work owing to the large mass of samples requiring to be dealt with, or failure to select the most suitable portions of stool for examination. Consequently it was impossible in every case to found the diagnosis on the bacteriological finding. In his opinion, there was no justification for the views of QUINCKE and LESCHKE [this *Bulletin*, Vol. 6, p. 72], who attributed to general alimentary disturbance a mild form of dysentery associated with bloody mucous stools. Müller-Dehan's experience was that slight and severe forms occurred promiscuously and that all cases with bloody stools should be grouped as dysentery. As a rule the course of the dysentery met with in Vienna was very mild. There was only a small percentage of fatal cases and these were usually complicated by wounds or pneumonia. Death from dysentery alone was very seldom. More frequently, the stools would improve but a cachexia supervened, the patient lying apathetic with dry skin, coated tongue and feeble frequent pulse. He had 30 such cases and no form of treatment proved of any avail. Rheumatism was the chief complication. Various forms of neuritis occurred, with skin hyperaesthesias and anaesthesias, trophic disturbances of nails, etc., and sometimes extensive muscular atrophy.

Many acute cases were associated with high temperature, and subfebrile temperatures were not uncommon especially in convalescence. Parotitis was a very uncommon complication.

With regard to therapy, the great majority got well without any particular therapy. Calomel (0·2 gm. three times in 36 hours) is useful and is only contraindicated by marked cachexia and heart weakness. Its administration, however, should always be well supervised. Systematic administration of opium should be strictly avoided. Remedies like emetin, uzara and simaruba have no definite effect. He has great faith in Bolus alba (100–200 gm. per day) and animal charcoal (up to 80 gm. per day). "Osmosyl," a colloidal silicate preparation, is also useful. Tannalbin is one of the best astringents. Dysentery serum was reserved for very bad toxaemic cases and in such the general condition and the action of the heart were markedly benefited. Chronic dysentery (i.e. cases in which bloody mucous stools persisted over long periods) was very rare. Generally the stools lost their dysenteric character but did not return to normal for months. In such cases enemata containing silver nitrate or Bolus alba were useful.

Intravenous injections of hypertonic salines were given in cases associated with profuse bloody diarrhoea. The rheumatic troubles do not react to salicylates. It is better to use antipyretics and analgesic ointments.

J. C. G. L.

TEN BROECK (Carl) & NORBURY (Frank Garm). **The Presence of *B. dysenteriae, B. proteus vulgaris, Bact. Welchii,* and Morgan's Bacillus No. 1, in the Stools of Cases of Infectious Diarrhea.**—*Boston Med. & Surg. Jl.* 1915. Aug. 19. Vol. 173. No. 8. pp. 280–284.

During the summer of 1914 the authors carried out a bacteriological investigation of the stools in a series of 79 cases of infectious diarrhoea in children at the Boston Floating Hospital, special search being made for *B. dysenteriae, B. Welchii* (*B. enteridis sporogenes* Klein) *B. proteus vulgaris* and Morgan's *Bacillus No.* 1. A brief review of the bacteriological findings in summer diarrhoea is given and in connexion therewith they state that "agglutinins for the Morgan's bacillus were not found in the blood of the cases from which it was isolated."

[This is not correct. The results of an extensive series of agglutination tests, for which the reviewer was responsible, will be found in the paper by MORGAN and LEDINGHAM, *Proceedings of the Royal Society of Medicine*, Epidemiological Section, March, 1909.]

With regard to the important question as to the clinical character of the cases, we are told that "infectious diarrhoea is characterised by more or less fever or prostration, tenesmus and the passage of an increased number of stools. *These stools contain mucus and frequently blood and pus.*" [This latter point should be remembered in the light of the resultant data.]

Of the 79 cases, 54 or 68 per cent. yielded dysentery bacilli of the mannite-fermenting type (Type Y). There was no evidence that *B. Welchii, B. proteus vulgaris, B. pyocyaneus,* Morgan's *Bacillus*

No. 1 or the paratyphoid bacilli played an etiological rôle in infectious diarrhoea, "though they probably influence the course of the disease that is apparently started by the dysentery bacillus."

B. dysenteriae (Shiga) was never recovered.

[The above findings are of interest and confirm much of the already recorded bacteriological experience on this subject in America. To this form of summer diarrhoea characterised by the presence of blood and slime in the motions, the term "Bacillary Dysentery" should be frankly applied.]

J. C. G. L.

TEN BROECK (Carl). **A Note on the Invasion of the Bodies of Infants by *B. dysenteriae*.**—*Boston Med. & Surg. Jl.* 1915. Aug. 19. Vol. 173. No. 8. pp, 284–286.

The author summarises the recorded data on the finding of *B. dysenteriae* outside the intestinal tract either ante- or post-mortem. Early in the summer season of 1914, a male baby was admitted with marked prostration and a temperature of 105°. The stools were not those of infectious diarhoea. A blood culture on the third day of the disease yielded *B. dysenteriae* (Flexner type) and the same organism was recovered from a second blood culture. The patient soon passed stools that were characteristic of infectious diarrhoea and after a long illness recovered. Seven attempts to isolate *B. dysenteriae* from the dejecta were unsuccessful. Blood cultures in 11 other cases of diarrhoea were negative. Also 14 cases were examined at autopsy; in no case was the organism got in the liver or spleen. The single positive blood culture is to be regarded as an accidental invasion rather than a usual feature of the disease.

J. C. G. L.

NORGATE (R. H.) & HALL (I. Walker). **An Outbreak of Institution Dysentery due to the Y Bacillus.**—*Bristol Med. Chirurg. Jl.* 1915. Mar. Vol. 33. No. 127. pp. 44–54.

An interesting contribution to the subject of bacillary dysentery in England. An outbreak of epidemic diarrhoea occurred at Stapleton Workhouse commencing middle of last November, reaching its height at end of December, and falling off towards the end of January of this year. Forty persons were attacked, with five deaths. It is of great interest that the first case and in all probability the person who introduced the infection was a tramp who had been casually employed with colonial troops on Salisbury Plain. This person was admitted to the workhouse on November 23rd and discharged on December 2nd. During this time one of the nurses attending him was transferred to a female ward and five days later the inmates of the female ward showed signs of the same condition and the whole of the patients and ward staff were in turn attacked. Four visitors to the ward suffered similarly. One of the nurses went home on a visit and four days later her father and a relative were attacked. One of the patients from the same ward entered a home in Clifton and after a few days four other servants were prostrated. There was then a lull of 14 days succeeded by a final outburst of 12 cases. From the clinical notes of the cases it is apparent that the symptoms in most cases were typical of bacillary dysentery

with blood and mucus in the motions. The stools were examined bacteriologically in 9 cases. In one which contained pus, mucus and blood, *B. dysenteriae Y* was recovered and also in another which contained pus and mucus but no blood. From seven other samples not containing pus, mucus or blood *Bac. Y* was not recovered. The sera of two cases from which *Bacillus Y* was recovered agglutinated *Bac. Y* in 1 in 50 to 1 in 125. Also similar titres were got in three cases from which *Bacillus Y* was not recovered. *B. pyocyaneus* was present in one case in which *Bacillus Y* was not found.

J. C. G. L.

ALTER. **Ruhrähnliche Darmerkrankungen.** [Dysenteroid Conditions.] —*Deut. Med. Woch.* 1915. Jan. 28. Vol. 41. No. 5. pp. 136–137.

A description of two outbreaks of institutional dysentery which like that recorded by LESCHKE [this *Bulletin*, Vol. 6, p. 72] was clinically indistinguishable from true dysentery but bacteriologically dissimilar. The outbreak of 1911 was not severe. It was however accompanied by tenesmus, blood and mucus in the motions and slight pyrexia. Generally the symptoms disappeared in 1–3 days. Neither *B. typhosus*, *B. paratyphosus* nor *B. dysenteriae* was found in stool or blood. In two cases streptococci were recovered from the blood. The outbreak of 1914 was somewhat more severe. As before, neither typhoid, paratyphoid nor dysentery bacilli could be cultured from blood, stools or urine, but from the blood and catheter samples of urine streptococci were isolated. In one fatal case in a lunatic patient, foci of slight haemorrhagic nephritis were found along with streptococci, which were also recovered from the liver and spleen. Two similar cases came to autopsy in which streptococci were cultivated from kidneys, liver, spleen, and heart blood. This "Pseudodysentery" was also found to be associated with sore throat or tonsillitis or enlarged cervical lymph glands, a point to which LESCHKE had drawn attention. The writer thinks this form of "Pseudodysentery" is really to be regarded as a subacute septicaemia proceeding from a catarrhal pharyngitis. [Mannite-fermenting *B. dysenteriae* have been so constantly associated with dysentery of the insane that these findings must at present be accepted with considerable reserve.]

J. C. G. L.

JUSTI (K.). **Ueber Pyozyaneuserkrankungen, insbesondere des Darmes.** [Infections with *B. pyocyaneus* specially of the Gut.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1915. Sept. Vol. 19. No. 17. pp. 458–470.

The writer discusses the rôle of *B. pyocyaneus* in the excreta of children suffering from dyspeptic conditions, malnutrition and certain forms of enterocolitis and dysentery. Though the organism has been met with by numerous workers in the stools of dysentery patients, either alone or in association with *B. dysenteriae*, it has not hitherto been regarded as playing any definite etiological rôle. From a review of the literature however, the writer believes that genuine cases of Pyocyaneus-dysentery do occur, which are accompanied by greenish

evacuations containing blood and mucus, and also tenesmus. In polluted wells *B. pyocyaneus* is frequently found and in the tropics, where water supplies not uncommonly come under suspicion, the possibility of *B. pyocyaneus* acting as an exciting cause of enteritis and dysentery should be borne in mind, especially when search for other known causes has failed.

J. C. G. L.

GHON (A.) & ROMAN (B.). **Ueber Befunde von Bacterium dysenteriae Y im Blute und ihre Bedeutung.** [Finding of *B. dysenteriae Y* in the Blood and its Significance.]—*Wien. Klin. Woch.* 1915. June 3. Vol. 28. No. 22. pp. 579–583; June 10. No. 23. pp. 620–624.

It is generally agreed that *B. dysenteriae* does not give rise to a septicaemia, but there are on record not a few instances in which the bacillus has been recovered from other regions of the body than the intestinal tract, e.g. heart blood, spleen, lymph glands, liver and bile. These exceptions do not materially alter the rule on the subject. The writers record an interesting series of cases in which this exceptional occurrence was observed. The cases are arranged in two groups:—

Group I (two cases). (1). Fatal case of acute haemorrhagic pseudo-membranous ulcerative colitis in a child 9 days old. *B. dysenteriae* "*Y*" was recovered from the spleen. (2). Fatal case of asylum dysentery in a man aged 66 years. *B. dysenteriae* "*Y*" was recovered from the spleen and the bile but not from the large bowel.

Group II. In this group of about a dozen cases the clinical picture was by no means definite. In some the picture was typhoid-like, while in others it was impossible to hazard any diagnosis. From the blood of every case however *B. dysenteriae* "*Y*" was recovered during life.

The clinical histories of one or two of these cases may be quoted.

Case I. Soldier (age 23), 7th February, 1915, had attack of bronchitis in the Carpathians. Came to Reserve Hospital on 21st February where a diagnosis of diffuse bronchitis and vasomotor neurosis was made. From 21st February to 17th March the temperature remained under 37° C. except on two days. The stools were normal.

On March 18th temperature rose suddenly to 38°·6 with sweating and severe headache, also a roseolar rash on the buttock. Enteric fever was suspected but after a short time the temperature fell and the patient recovered. *B. dysenteriae Y* was recovered from the blood on 19th March. On 19th April neither typhoid, paratyphoid nor dysentery bacilli could be isolated from the stools but *B. dysenteriae* "*Shiga*" was present in the urine.

Widal tests on 19th April and 8th May showed a slight reaction with *B. dysenteriae Y* (1 in 20 to 1 in 40).

Case II. Typhoid suspect. Spleen enlarged and stools of pea soup character. Stools negative for typhoid, paratyphoid and dysentery bacilli. Serum agglutinated *B. typhosus* weakly in 1 in 80, *B. paratyphoid* (*B*) weakly in 1 in 20, *B. dysenteriae Shiga* in 1 in 20 and *B. dysenteriae Y* in 1 in 40.

In two other cases with typhoid stools roseolar rash and enlarged spleen, *B. dysenteriae Y* was recovered both from the blood and from the motions.

A satisfactory explanation of the findings cannot yet be brought forward. It is suggested that in a majority of the cases enteric fever was the primary disease, while bacillary dysentery was either mixed with it or occurred as a secondary infection. In other cases, bacillary

dysentery appeared to have been the chief infection with enteric as the secondary. [If enteric was the chief infection, it is difficult to understand why *B. typhosus* was not recovered also from the blood, at least in some cases.] The further suggestion [a very probable one] made is that these cases were really dysentery carriers, in whom just as in typhoid carriers there may be a liability to occasional invasion of the blood stream by bacilli vegetating in the intestinal tract.

[These cases are of great interest at the present time when dysentery and typhoidal disease are prevalent in the field and they deserve the most careful bacteriological investigation. The reviewer and his colleague (PENFOLD) have recently recovered *B. dysenteriae* "Shiga" from the blood during a so-called relapse (pyrexial exacerbation) in a case of Paratyphoid (A) fever. *B. para.* (*A*) was recovered from the blood during the initial pyrexia.]

J. C. G. L.

GALAMBOS (Arnold). **Ueber das gleichzeitige Auftreten von Typhus abdominalis und Dysenterie.** [The Concomitant Occurrence of Typhoid and Dysentery.]—*Wien. Klin. Woch.* 1915. June 3. Vol. 28. No. 22. pp. 589–590.

The occurrence of dysentery after recovery from typhoid was noted by the author in 41 cases, the commencement falling generally in the third week of convalescence. Almost pathognomonic is the change in the external appearance of the patient. The face takes on a greyish cyanosed appearance, there are deep rings round the eyes and the distal extremities are cold, thin and dry. The prognosis of posttyphoidal dysentery is bad, even though the dysentery itself is not severe. The disease runs an afebrile course and yet complications like pneumonia and abscess of the lung may coexist. The simultaneous appearance of typhoid and dysentery was observed in nine cases, all but one ending fatally. The chief complication in this form of mixed infection is gangrene of the extremities (present in six out of nine cases), a complication noted also in three of his posttyphoidal dysenteries and in two of his 15 cases of postdysenteric typhoid [see below.] The gangrene affected the lower extremities as a rule and began with paraesthesia. The diseased spots became cold and oedematous and the distal parts cyanotic and finally gangrenous. In many cases death occurred before final mummification. Cases of post-dysenteric typhoid numbered 12 to 15, the prognosis here being much more favourable than in the two previous types. [Bacteriological investigations in such cases would be of great interest.]

J. C. G. L.

SOLDIN (Max). **Widalsche Typhusreaktion bei Y-Ruhrkranken.** [Widal's Reaction in Y-Dysentery.]—*Deut. Med. Woch.* 1915. July 15. Vol. 41. No. 29. pp. 858–860.

The author discusses the question of positive typhoid Widal findings in cases of bacillary dysentery and gives a series of cases in which such reactions were obtained. It is at the commencement of the dysentery infection (due to type Y) that the positive typhoid Widal may be

obtained. After a few days it disappears or is very markedly weakened, when the specific agglutinin development to *B. dysenteriae Y* can now be demonstrated. This specific reaction, as is well known, may not be obtainable in the early days of the dysentery infection.

J. C. G. L.

MAREK (Richard). **Positive Typhusreaktion bei Ruhr.**—*Wien. Klin. Woch.* 1915. May 20. Vol. 28. No. 20. pp. 530–533.

Several papers have recently appeared in which attention has been drawn to the occurrence of positive typhoid and paratyphoid Widal reactions in cases resembling clinically bacillary dysentery. The author gives his experience on this question and records notes of 17 cases, all of which with one exception gave a clinical picture in no way suggesting a typhoid infection. Many of the cases were passing blood and mucus while others were suffering from a dysenteric relapse. In all the agglutination for *B. typhosus* was positive and for *B. dysenteriae* [? Type] negative (with one exception). [We are not told at what date the agglutination test was performed or what the test organism was.] Though the stools in most cases contained mucus, dysentery bacilli appear to have been recovered only from two cases. The exceptional case was one in which no dysentery organisms were found in the stools, which contained no mucus or blood. The disease ran a febrile course and the patient was transferred to a typhoid ward. In this case the serum agglutinated *B. dysenteriae* in 1 in 100 (+++) and also *B. typhosus*. [If this case is really to be considered one of enteric, as the author says, why is this the only one of the series in which the serum gives a positive agglutination for *B. dysenteriae* ?] His results lead him to the conclusion that in many cases of dysentery the bacteriological and serological investigations are apt to miscarry and that therefore the diagnosis must rest on clinical grounds.

The author however believes that anomalous reactions of this kind may be explained on the basis of a mixed infection. [This is very probable. At the present time in the field, where dysentery and typhoidal disease are both prevalent, evidence of mixed simultaneous nfections or of secondary infections arising in the convalescent stage of the primary has come from many sources.]

None of his cases had been inoculated against enteric. The rest of his paper is devoted to a very unconvincing argument in which he seeks to show that "certain organisms which can produce dysentery are morphologically or biologically allied to *B. typhosus*." This comforting assumption would explain why he was unable to isolate *B. dysenteriae* from his cases and would also explain, on the theory of group agglutination, the positive typhoid Widals. [The question as to the value to be attached to serological tests in diagnosis of typhoid and dysenteric affections is a very important one, and the work on which conclusions are based ought to be of the most careful character with plentiful controls. There is no doubt that the best guide to diagnosis is the demonstration of the actual invading organism and on this object most attention should be concentrated.]

J. C. G. L.

BRYSON (J. G.). **Clinical Aspects of Bacillary Dysentery in Texas.**—*Texas State Jl. Med.* 1915. May. Vol. 11. No. 1. pp. 36–38.

A clinical lecture on bacillary dysentery as it exists in Texas. Apparently the writer is able to detect *B. dysenteriae* (Shiga) by microscopical examination of a Gram stained film of mucus from the dejecta! Dietetic treatment and various methods of drug therapy are described, including saline bowel washes containing 1 in 4,000 or 1 in 5,000 $HgCl_2$, or silver nitrate (20 grains to the quart of sterile warm water). Serum therapy is not referred to. The course of the disease is usually from 12 to 30 days, but the most severe cases usually terminated in death during the second week.

J. C. G. L.

REMLINGER (P.) & DUMAS (J.). **Insuffisance surrénale au cours de la dysenterie.**—*C. R. Soc. Biol.* 1915. Aug. Vol. 78. No. 14. pp. 433–435.

The "acute suprarenal syndrome" (very different from the Addisonian syndrome) has in recent years been observed in a large number of infections and intoxications. The authors have noted it in 4 per cent. of cases of bacillary dysentery observed in the Argonne in the winter of 1914–15. The diagnosis has been verified at autopsy by the presence of hypertrophy of the adrenals and by the absence of other lesions capable of accounting for the symptoms observed during life. This syndrome appears in benign as well as in severe cases and at any period of the course. The appearance of the patient changes completely—sunken eyes, pinched nose, peculiar bluish colouration of skin, great emaciation, hands and feet and face of violet tint like that seen in cholera, frequent and often scarcely perceptible pulse, dry tongue, extreme thirst, nausea and vomiting, abundant and very liquid stools, etc. The nervous system is also affected. The patient is inert, apathetic, and semi-somnolent, sometimes very restless and turning from side to side in bed. He may even try to get out of bed. At autopsy one finds nothing very obvious apart from the intestinal lesions and hypertrophy of the mesenteric glands. The spleen is small, hard and contracted and the heart is dilated. The suprarenals alone attract attention. They are considerably hypertrophied (two to three times the normal volume). Histologically there is congestion of the capillaries and diffuse coagulation necrosis affecting both the cytoplasm and the nuclei of cells. The lesions recall those found after injection of diphtheria toxin and are due probably to a direct action of the dysentery toxin on the suprarenal capsule.

J. C. G. L.

VON GROEER (F.). **Ueber die Behandlung der bazillären Dysenterie mit Adrenalin.** [The Treatment of Bacillary Dysentery with Adrenaline.]—*München. Med. Woch.* 1915. Apr. 6. Vol. 62. No. 14. pp. 487–489.

The writer strongly recommends the use of adrenalin, which proved in his experience the most valuable agent in the symptomatic treatment of bacillary dysentery. Administered per os it appears to have a

remarkable sedative influence on the abdominal pains and the tenesmus and its effect on the general condition is equally marked. Unlike the opiates, it may be given with perfect safety; 10–20 drops of adrenalin (Suprarenin Höchst or Adrenalin Takamine in 1 per 1000 of the commercial solution) every hour or every two hours. It may also with great advantage be administered in enema form (2 litres of a 1 in a million or 1 in half a million solution) in physiological saline warmed to 40° C. The enemas are given in the knee-elbow position or in the lateral position (in severe cases) with the help of a soft stomach sound, at least 1 meter long and about 8 mm. thick. Some minutes before giving the enema, it is wise to administer 20 drops of adrenalin by the mouth. These adrenalin enemas have a remarkable effect in checking the loss of blood from the bowel, in restoring the normal character of the motions and in improving the general condition of the patient.

J. C. G. L.

SCHMIDT (Ad.). **Prophylaxe und Therapie der Ruhr im Felde.** [Prophylaxis and Treatment of Dysentery in the Field.]—*München. Med. Woch.* 1914. Sept. 8. Vol. 61. No. 36. pp. 1917–1920.

In war, every case of diarrhoea accompanied by tenesmus should be reported. If the motion is bloody or mixed with blood and slime, the soldier should be reported sick and isolated as soon as possible. It is not advisable to wait for bacteriological results. Stools and body linen should be disinfected and care should be taken to keep flies away both from the patients and their excreta. Polyvalent dysentery serum should be given as early as possible. As a rule three doses spread over three days are sufficient. The fever diminishes and there is a marked improvement in the general condition as gauged by the pulse. A small and frequent pulse even with low temperature and comparatively slight local symptoms is prognostically unfavourable. Frequent vomiting is also unfavourable. Serum therapy has a less pronounced action on the tenesmus and the diarrhoea. To combat these, bolus alba or decoction of Simaruba should be given. Emetin is of no value in bacillary dysentery. The author strongly disapproves of calomel or castor oil in early cases. [On this particular point there appears to be an extraordinary diversity of opinion.] Enemata containing tannin or iodoform are also inadvisable as they are not retained and are painful. On the other hand, small suppositories containing extract of belladonna with opium are useful. In collapsed cases, camphor and saline infusions are recommended. Patients should not be discharged too early as there is always the danger of relapse. Moreover the carrier condition should be kept in view.

J. C. G. L.

NOC (F.). **Vaccinothérapie de la Dysenterie bacillaire et des Diarrhées chroniques.**—*Bull. Soc. Med. Chirurg. Indochine.* 1915. May. Vol. 6. No. 6 pp.

In the treatment of acute and subacute dysentery Noc employs the following procedure. On the first day serum is given, the dose varying according to the severity of the case, and on the next day vaccine

treatment is begun, the injections being made intramuscularly. The vaccine is a mixed one and is thus prepared: 24 hour cultures of *B. dysenteriae* (*Shiga*) and *B. dysenteriae* (*Flexner*), on peptone agar (one culture of each) are emulsified each in 20 cc. physiological saline. They are not otherwise standardised as, in the author's experience, this dilution (one slope in 20 cc.) gives emulsions which in the quantity administered are not calculated to produce severe local or general reactions. The emulsions are heated at 51° for an hour. Other types of dysentery bacilli may, if considered necessary, be added to the vaccine and autogenous vaccines are also to be recommended. The first dose of the mixed vaccine, viz., $\frac{1}{4}$ cc., may be given without danger. A second dose of $\frac{1}{4}$ cc. is given three days later and a third dose of $\frac{1}{2}$ cc. may be given four days after the second. As a rule satisfactory results can be obtained after one or two injections. Albuminuria is not a contraindication to vaccine-therapy but, if pyelonephritis or old cystitis is present, it is advisable to commence with a smaller dose (e.g. $\frac{1}{10}$ cc. of the mixed vaccine).

Useful though less rapid effects can be got in mixed amoebic and bacillary infections, where the object is to destroy pseudodysentery bacilli on which the amoebae thrive.

J. C. G. L.

Mosby (Wm. L.). **Treatment of Dysentery.**—*Kentucky Med. Jl.* 1915. July 1. Vol. 13. No. 8. pp. 342–344.

A clinical lecture on the treatment of bacillary dysentery, from which the following notes have been extracted. Incidentally the author mentions that prophylactic vaccination gives immunity lasting 8–10 weeks. The first dose of the killed bacillus is $\frac{1}{2}$–1 million or more, and a second is given two to three days later containing a double quantity. [The author does not state whether the vaccine is prepared from Shiga or Flexner bacilli or both.]

In acute cases no food is given for 24–48 hours. Afterwards, broths are given or albumen water, barley water or rice water. Milk is prohibited in acute cases as encouraging intestinal fermentation. If the patient is seen early, a non-irritating purge such as Rochelle salts or castor oil with sod. bicarb. is recommended. Should these fail to purge an enema of normal saline or olive oil may be given. Bismuth in 20–60 grain doses is very useful and turpentine is also of value as an intestinal antiseptic. Irrigation of the colon is practised with alum (one teaspoonful to the pint of water with 30 drops of Tinct. Opii), or tannin (2–3 per cent. solution), boric acid (5 per cent. solution), salicylic acid (2 per cent.), nitrate of silver (1 in 5,000 to 1 in 500) but it should be preceded by rectal suppository of cocaine, morphine or opium with belladonna.

He has no personal experience of serum treatment but believes it is of great value in reducing mortality from bacillary dysentery. Vaccine treatment has not been encouraging.

J. C. G. L.

ROUBITSCHEK & LAUFBERGER. **Zur Behandlung der Dysenterie-Rekonvaleszenten.** [The Treatment of Dysentery Convalescents.]—*Therap. Monatshefte.* 1915. June. Vol. 29. No. 6. pp. 327–330.

Before leaving hospital, the stools of convalescent dysentery cases are examined three times at intervals of a week. If negative, the patient is sent to a convalescent home. These convalescents must be carefully looked after. They have lost much in weight and complain usually of dyspeptic troubles. Many cannot tolerate meat or fat. In 100 cases to which test meals were administered, 50 showed a diminution of the free HCl and of the total acidity. Subjective symptoms such as fullness in the stomach region after meals, vomiting and frequent stools were prominent. The evacuations were 3-4 daily, foul smelling, and of pea-soup character and often contained gas bubbles and slime. The reaction of the stools was usually acid. So far as the diagnosis could be established by agglutination tests with the patients' sera, 34 per cent. of the cases were due to *B. Flexner* and 13 per cent. to *B. Shiga.* The latter cases were always more severe both in the acute and chronic stage. Rheumatism occurred as a complication in 10 per cent. of the cases. In one case acute jaundice developed and in three per cent. typhoid fever developed during the convalescence from dysentery. The subacidity of the stomach contents may have been due to pushing of the bolus and animal charcoal therapy, because in cases which received dysentery serum early this subacidity did not develop nearly to the same extent. Very helpful in this form of dyspepsia was Pancreon (Rhenania) in tablets of 0·25 gm., three tablets being taken at the midday meal; 25 drops of dilute hydrochloric acid in a wine glass of water were given half an hour after eating.

A sample diet sheet for these cases is as follows :—

1st breakfast.	200 cc. tea or cocoa, 1 roll.
2nd breakfast.	¼ litre of milk.
Midday meal.	200 cc. soup (without fat) containing vermicelli or macaroni or rice.
	120 gm. minced veal or beef.
	250 gm. potato or carrot purée.
	300 gm. boiled macaroni or vermicelli.
Tea	200 cc. tea or cocoa, 1 roll.
Evening meal.	Twice a week, 7 dkg. thin ham.
	On other days, 300 gm. vermicelli, groats or rice in milk.

The caloric value of this diet is 2,200. In spite of its low value, the weekly increase of weight averaged 490 gm.

Shiga infections ran a much more chronic course than *Flexner* infections and were more subject to troublesome sequelae.

J. C. G. L.

BROSCH. **Ueber die Kriegsbrauchbarkeit einer neuen Methode der Ruhrbehandlung.** [The Employment in War of a New Method of Treatment of Dysentery.]—*Wien. Med. Woch.* 1915. Apr. 10. Vol. 65. No. 15. pp. 634–635.

Description of a new method of treating bacillary dysentery by the aid of an automatically acting bowel washer (Enterocleaner. Patent Enterocleaner Co. Vienna). For use in war time the method requires simplification. The patient lies partly on his side and partly on his

abdomen, in which position a negative abdominal pressure is caused and the capacity of the intestine is consequently increased. A reservoir of 40 litres suffices for two patients in adjoining beds, the wash water being recovered in a large vessel placed between the beds. The wash fluid consists of either Ringer's solution, or Bolus alba suspension (200 gm. to 20 litres of water) or Hexamethylentetramin (10 : 20,000). In fresh cases of moderate severity a single wash out often suffices to bring the number of stools down to one or two within 24 hours, while slight cases may have no stools at all in the following 24 hours. Some very severe cases resisted this treatment. In such, washes containing alcohol and tannin ($\frac{1}{2}$ per cent. salt solution to which was added 5 per cent. alcohol and $\frac{1}{2}$ per cent. tannin) gave the best result.

Altogether 1,358 cases (*B. dys. Flexner* in all) were treated with no death, whereas before this method the mortality had been 5 per cent. Clinical cure is not synonymous with freedom from the bacilli. In 244 cases, partly acute and partly chronic, the bacilli could not be isolated from the stools after the first or second washing. In 90 cases 6–10 washings were necessary and a still longer period was required in the case of 24 obstinate convalescent carriers.

Eleven cases of enteric fever (bacteriologically diagnosed) were treated by the enterocleaner and ran a remarkably light course.

J. C. G. L.

DOPTER. **Prophylaxie de la Dysenterie bacillaire.**—*Paris. Méd.* 1915. July 24. Vol. 5. Nos. 11–12. pp. 203–206.

This paper deals only with the sanitary measures to be taken in handling cases of dysentery and suspects, the question of isolation, the bacteriological examination of excreta, disinfection of latrines, purification of water supplies, the preservation of meat and food stuffs from contamination by flies, the hygiene of the canteen, the protection of the soldier against cold, the supply of proper food, use of incinerators, etc., etc.

Cases should not leave hospital until the stools are free from *B. dysenteriae.* Dysentery suspects should be treated like cases but, if possible, in a separate ward until the diagnosis is confirmed by clinical and bacteriological investigation.

J. C. G. L.

PRIBRAM (Ernst). **Die Aufgaben des Bakteriologen bei der bazillären Dysenterie.** [The Task of the Bacteriologist in Bacillary Dysentery.]—*Wien. Med. Woch.* 1915. May 22. Vol. 65. No. 21. pp. 826–830.

The writer discusses the rôle of the bacteriologist in war time with special reference to bacillary dysentery and the necessity of examining samples of stools on a large scale. Matters of purely bacteriological interest must be postponed to a future time. It is sufficient for him to know how he can best help the clinician and on the other hand he must see that the clinician confines himself to questions that are of strictly practical interest. Plating methods, in his opinion, are

troublesome in dysentery as other organisms get into the intestine which, though not the cause of true dysentery, may produce similar clinical symptoms. [What these organisms are is not specified.] It takes a few days before differentiation and identification of members of the dysentery group can be effected. Troubles also arise in the application of fermentation and agglutination tests, especially in the case of atypical varieties. Consequently, bacteriological examinations if exactly carried out do not always meet the clinical requirements fast enough. What does the clinician want to know? He wants to know (1) whether he has to do with an infectious disease or a simple catarrh of the large intestine, and (2) whether he should give serum or not. The clinician should not wait until the type of dysentery bacilli present is ascertained. He should give the first injection of serum as soon as possible. The bacteriologist should work on a uniform prescribed scheme.

J. C. G. L.

MORGENROTH (J.). **Trockennährböden nach Doerr zur Typhus- und Dysenteriediagnose.** [Doerr's Nutrient Media for the Diagnosis of Typhoid and Dysentery.]—*München. Med. Woch.* 1914. Dec. 8. Vol. 61. No. 49. p. 2355.

In war time the difficulty of securing skilled laboratory assistants is notorious and the manufacture of nutrient media is hampered. Morgenroth recommends the use of dried media in tablet form (Endo, Conradi- Drigalski, etc.). The tablet is powdered, the correct amount of water added to dissolve and the fluid finally boiled over the flame and poured on the plate. Such media are not inferior to media prepared in the ordinary way by skilled assistants. [In this country dried or tablet media have been procurable for a considerable time.]

J. C. G. L.

FALTA (W.) & KOHN (Henriette). **Zur Frage der Variabilität von Dysenteriestämmen der galizisch-russischen Epidemie (Herbst 1914).** [The Variability in Dysentery Strains from the Galician-Russian Epidemic; Spring, 1914.]—*Wien. Klin. Woch.* 1915. June 3. Vol. 28. No. 22. pp. 583–589.

The writers examined the excreta of 48 cases of dysentery—mainly soldiers. Only in a few cases was *B. dysenteriae Shiga* recovered. In a large group of cases giving typical clinical symptoms they recovered no non-lactose fermenters on the Drigalski plates, a circumstance which led them to pay attention to the red colonies (gas formers). These gave gas in glucose and lactose and produced indol. Some of them were agglutinated highly by Shiga and Flexner serum. Specific sera prepared from certain of these gas forming types agglutinated only the homologous strains [like many *B. coli* sera]. The authors cannot come to a definite conclusion with regard to these strains. They were very toxic to laboratory animals. By passage through white mice and rabbits their true Shiga strains were apparently converted into gas formers [a very difficult and fallacious form of experiment]. They were blue and, later, red on Drigalski. [In all probability

they were dealing with late lactose fermenters or *B. coli mutabile.*] In summarising their paper they state that in the majority of their cases they got paradysentery strains of very variable character with all transitions between dysentery and coli races. Red colonies on the plates should not be neglected in the search for *B. dysenteriae.* [On the whole a very unconvincing paper.]

J. C. G. L.

MISSIROLI (A.). **La reazione termoprecipitante nella diagnosi della dissenteria bacillare.** [The Thermoprecipitin Reaction in the Diagnosis of Bacillary Dysentery.]—*Policlinico.* Sez. prat. 1915. Oct. 3. Vol. 22. No. 40. pp. 1339–1340.

The author finds that from 24 hour broth cultures of dysentery bacilli he can obtain thermostable precipitogen extracts, which give precipitates with the sera of animals immunized with *B. Shiga-Kruse*, and more weakly with those immunized with *B. Flexner*, though with *B. Strong* the result is negative. The author thinks that this result may prove practically useful for diagnostic purposes in the following way. If a flake of mucus from the stools of a dysentery patient, containing dysentery bacilli in nearly pure culture, is rubbed up with 4 to 5 volumes of physiological salt solution and is then heated in the oven at 100° for 10 to 15 minutes, it will give the above sero-reaction or not, according to the particular bacillus present.

J. B. Nias.

KESAVA PAI (M.). **An Investigation into the Bacteriology of Dysentery in the Madras Lunatic Asylum.**—*Indian Jl. Med. Research.* 1915. July. Vol. 3. No. 1. pp. 149–165.

The writer commences with a brief review of the aetiology of dysentery in the civil population of India and in institutions such as jails and lunatic asylums. Bacillary dysentery is not so common as the amoebic form. FORSTER isolated dysentery bacilli from 81 out of 128 cases of dysentery, *B. Shiga* predominating, while WELLS, in the Hazaribagh Central Jail, isolated only 14 strains of dysentery bacilli from 268 cases (4 *Shiga*, 9 *Flexner*, 1 *Y*). Similarly among the civilian and military population of Bombay GREIG and WELLS found that only 13 out of 585 cases were bacillary in origin (4 *Shiga*, 9 *Flexner*). The writer has made a similar enquiry at the Madras Lunatic Asylum and out of 136 cases examined during the period January 1911–December 1914, succeeded in isolating dysentery bacilli in 54 (18 *Shiga*, 36 *Flexner*). The 18 *Shiga* strains behaved alike on all the carbohydrates tested. On the other hand the mannite-fermenting strains, grouped as *Flexner* or *Y* according to the indol tests, showed variations in each group, especially towards maltose and raffinose. A series of agglutination reactions was carried out with the sera of patients at different stages after the acute attack (macroscopic sedimentation test of WRIGHT, in capillary tubes) but the results were disappointing and great difficulty was experienced in reading the results. On the whole, the titres obtained were very low. The polyvalent antidysentery serum of the Lister Institute was found of great service in the diagnosis of the strains isolated from the cases.

Relapses were noted in several asylum cases and in two such the organism causing the relapse was not identical with that which caused the primary attack.

The writer attempted prophylactic vaccination with a polyvalent vaccine prepared from all the strains recovered. The vaccine consisted of *Shiga* strains and *Flexner* strains in the proportion of 2 : 1 and was given in doses of 250 million and 1,000 million. So far, however, the results have not been encouraging and the author thinks it doubtful " if lasting antibacterial immunity against dysentery can ever be established either naturally or artificially."

[Some notes of the author's experience with regard to the local and general reactions following the vaccine would be of great interest.]

J. C. G. L.

BUSSON (Bruno). **Immunisierungsversuche gegen Dysenterie mit Toxin - Antitoxingemischen.** [Immunisation Experiments in Dysentery with Mixtures of Toxin and Antitoxin.]—*Wien. Klin. Woch.* 1915. Aug. 12. Vol. 28. No. 32. pp. 853–856.

Active immunisation against bacillary dysentery (type Shiga) has not hitherto been a very successful or practical measure owing to the severe local and general reactions following the inoculation of the killed bacilli. During the Russo-Japanese war SHIGA employed as a prophylactic dysentery bacilli with antidysentery serum simultaneously injected. DOPTER has recommended sensitised vaccines and has published some experimental results with this method in mice. The writer has carried out a series of experiments on rabbits with dysentery toxin given (1) alone, (2) in conjunction with dysentery antitoxin in excess, (3) in conjunction with dysentery antitoxin just sufficient for neutralisation, and (4) in conjunction with dysentery antitoxin insufficient for complete neutralisation of the toxin. After immunisation the degree of immunity of the surviving animals was tested by the multiple lethal dose method. The results showed that the under-neutralised mixture (in which free toxin was present) was the most satisfactory method both from the point of view of mortality occurring during the course of immunisation and of the degree of immunity finally attained. Neutral or over-neutralised mixtures do not confer immunity and apparently if immunity is to be obtained there must be free toxin in the mixture. A small amount only is sufficient, while the addition of the serum obviates the severe local and general reactions that would follow the injection of toxin alone. The method may be found of practical value in man. It is founded on the principle developed by BEHRING in his prophylactic vaccine for diphtheria.

J. C. G. L.

FLAGGELLATE DYSENTERY.

BARLOW (Nathan). **Craigiasis.**—*Amer. Jl. Trop. Dis. & Prevent. Med.* 1915. May. Vol. 2. No. 11. pp. 680–702.

The author's researches have been conducted at Cuyamel, Honduras. He writes :—" In February of 1914, while studying intestinal infections in Honduras, it was noticed that certain of the cases presenting symptoms of chronic diarrhoea, or mild dysentery, had in the faeces an

actively motile flagellate, which did not correspond to the descriptions of cercomonas or trichomonas and which repeated observation, under an immersion lens, at the time when motion was becoming sluggish and ceasing, demonstrated to have but one flagellum." The flagellate was found to belong to the genus Craigia.

"Craigiasis is a diseased condition of the body, produced by infection with protozoa belonging to the genus *Craigia*, Craig, 1908, emend. Calkins, 1913." Fifty-six cases were studied. Five were due to *Craigia hominis* and the remainder were infected with a new species, *Craigia migrans*.

The author briefly recapitulates the life-cycle of *Craigia hominis* as given by Craig, thus:—"In the amoebic stage, the organism reproduces by simple division as a typical amœba for several generations, as long as conditions are favourable. It then encysts, and within the cyst are developed numerous small swarmers which, on escaping, develop a single flagellum; reproduce by longitudinal division for several generations, after which the flagellum disappears, and the amœbic stage of development is again entered." The young forms possess a spherical body 3μ to 6μ in diameter. The fully developed flagellates measure 10μ to 20μ in diameter, and have one flagellum, a spherical nucleus and an accessory nuclear body. The amœbae vary from 10μ to 25μ, averaging 18μ. When encysted, they measure about 15μ in diameter.

"The life cycle of *C. migrans* differs from that of *C. hominis*, in that instead of dividing for a while as an amœba, then encysting, forming swarmers, and dividing for a while as flagellates, each flagellate on attaining full development becomes an amœba without dividing, and each amœba encysts and produces a number of flagellates. This organism may have to be placed in another genus eventually." In other respects the life history resembles that of *C. hominis*. The young spherical forms measure 3μ to 7μ in diameter. The flagellum of *C. migrans* stains more deeply than that of *C. hominis* and has a peculiar banded appearance. The amœbic stage varies from 12μ to 30μ, averaging about 20μ. There is no accessory nuclear body present. Encysted amœbae average about 18μ. "The young swarmers are somewhat larger than those of *C. hominis*, the usual size being about 5 microns. The cysts, therefore, contain from 20 to 30 young forms. The most of the round forms in the cysts of *C. hominis* are about $3\frac{1}{2}$ microns in diameter, and there are 40 or more in a cyst."

The author endeavours to give points of differentiation of species of Craigia from entamœbae, trichomonads and allied flagellates.

"There is but little doubt that the chief source of infection is from polluted water. . . ." "A patient may carry Craigia for months before seeking medical aid, but the infection, although in the beginning mild and insidious, is fully as dangerous as that of *E. histolytica* to the patient, and even more so to the community, as it is much more common for a patient with Craigiasis to remain a carrier for years than is the case in entamœbiasis. . . . The only distinction between the stools of Craigiasis and entamœbiasis is that in the latter severe hæmorrhages occur frequently."

The diagnosis can only be made by finding the parasites in the faeces. "The swarmers are the most conspicuous objects imaginable, and doubtless have often been seen and regarded as cercomonads or

trichomonads, the amœbic forms having been taken for *E. coli* in the case of *C. hominis*, and for *E. histolytica* in the case of *C. migrans*. The clinical diagnosis is almost impossible."

"The only effective treatment was found to be either emetin, hypodermically, or ipecac, internally. The treatment should be pushed to large doses and continued for a long time."

The author gives full details of 26 cases.

There is a plate illustrating the two species of Craigia described.

H. B. F.

LYNCH (Kenneth M.). **Clinical and Experimental Trichomoniasis of the Intestine. With Cultivation of the Causative Organism.**—*New York Med. Jl.* 1915. May 1. Vol. 101. No. 18. Whole No. 1900. pp. 886–889.

The author refers to the confusion regarding the names of the species of Trichomonas found in man. Full details are given of a patient at Charleston, South Carolina, suffering from intermittent attacks of diarrhoea. Many trichomonads were found in a stool passed after the administration of a purge of magnesium sulphate. The parasites were pear-shaped and measured about 13μ by 18μ when fresh, and about 16μ by 21μ when fixed and stained. Four flagella were present at the anterior end and there was an undulating membrane along one side.

The trichomonads were successfully cultivated in vitro on bouillon acidified with about 0·05 per cent. acetic acid, and at about 30° C. Subcultures were obtained by inoculating fresh tubes every third day. It was not possible to exclude the growth of bacteria, which, after about four days, overran the cultures.

Encysted trichomonads were seen from time to time in the patient's stools, in rabbits artificially infected with the parasites, and in cultures. The flagellates were successfully transmitted to rabbits by feeding and by rectal injection of both stools and cultures.

The author sets forth his summary and conclusions at length, thus :—

"Having obtained *Trichomonas hominis* Davaine or *Trichomonas intestinalis* Leuckhart from the feces of a man suffering from an intermittent diarrhea; having cultivated the organism extensively *in vitro*, in which the life cycle was that of simple direct division with the development of cysts under conditions unfavorable to proliferation; and transmitted the infection from the human stools and from cultures, by mouth and by rectum to rabbits, with the production of a similar diarrhea, and recovering the organism from these animals; and having seen the parasite lose its characteristic form and assume a nonflagellated ameboid appearance without undulating membrane, under the influence of certain media, having seen it recover and return to form; and having failed to keep the parasites alive, either active or as cysts in water more than a few hours, and only a few days under the most favorable circumstances of a continuous nature; we feel justified in making the following conclusions, especially in the light of the previous report concerning *Trichomonas vaginalis*.

"1. Trichomonas is a definitely pathogenic micro-organism.

"2. The intestinal form produces a mild enteritis manifested by an intermittent diarrhea.

"3. Infection by this organism may occur by mouth or by rectum, more naturally by mouth, from active forms in rabbits, but probably from encysted cells in human beings.

"4. The duration of the infectivity of water containing either active trichomonads or the encysted is probably not long.

"5. The form of the cell may be so altered by environment as to render immediate recognition difficult.

"6. This organism is capable of artificial cultivation, this having been accomplished.

"7. It multiplies by direct cell division, this with the transformation into encysted form which may again become active, constituting the life cycle of the organism.

"8. Rabbits are susceptible to experimental infection by Trichomonas."

H. B. F.

CHATTERJEE (G. C.). **On a Five Flagellate Trichomonas (N. Sp.) Parasitic in Man.**—*Indian Med. Gaz.* 1915. Jan. Vol. 50. No. 1. pp. 5–7. With 1 plate.

The parasite described by the author was found in stools of six cases of chronic dysentery in India. "The flagellate in question has got five anterior flagella, one posterior "rand" flagellum, one undulating membrane—characters possessed by none of the intestinal flagellates hitherto described." The movements of the organism are colloquially described.

As regards morphology, the author states:—"The following structures were seen in stained specimens—nucleus is very big, rounded in shape, a nuclear membrane is clearly seen. Karyosome is present in the form of small clumps distributed irregularly through the substance of the nucleus. [This seems to be an unusual type of karyosome.] In many specimens nucleus is homogenous [*sic*]—no karyosome can be made out. The nucleus is situated in the extreme anterior end just behind the basal granules. The flagella are six in number, five being free and directed forwards. The sixth one is a "rand" flagellum forming the border of the undulating membrane, through the length of the body and then becomes free, projecting out near the tail." The body is said to be pear-shaped, one side being usually a little more convex than the other. There is a cystotome [*sic*]. "From the basal granules are seen starting a fine chromatic line passing transversely to the opposite edge surrounding the cystotome. . . ." "In well fixed specimens stained by Giemsa, a well marked axostyle can be seen arising from the posterior part of the nucleus ending near the tail." A red blood corpuscle is stated to have been found inside the body of the organism in some cases. Rounded forms were sometimes seen. Some parasites were observed in process of division.

"The body of the organism measures 8 to 10μ in length, 5 to 6μ in breadth, the 4th anterior flagella [*sic*] 8 to 10μ, the short 5th anterior flagellum 6 to 8μ. The projecting portion of the 6th "rand" flagellum is 3 to 4μ. The nucleus is 3μ in diameter."

The author names the parasite *Pentatrichomonas bengalensis*, n. subgen. et n. sp. The parasite should be compared with that described by DERRIEU and RAYNAUD under the name *Hexamastix ardin-delteili* [see this *Bulletin*, Vol. 4, p. 316.] The generic name Hexamastix is, however, pre-occupied (Alexeieff, 1912).

[The lack of precision in the description of the organism is to be regretted. Such statements as the following may be humorous but are hardly scientific:—"In the anterior end, in slowly moving

organisms, a slight depression can be made out from which *a bunch of whiskers* can be seen projecting out which move spasmodically forward and backwards *like the oars of a boat.* The posterior end terminates *in a stumpy tail.*" The organism is also said to be capable of "*gliding through solid* faecal matters." (Italics not in original). Unfortunately, some of the figures are drawn from obviously distorted specimens.]

H. B. F.

CHATTERJEE (G. C.). **On a Macrostoma found in Human Intestinal Contents.**—*Ind. Med. Gaz.* 1915. Vol. 50. No. 4. pp. 135–136. With 1 plate.

The author describes a flagellate organism seen "in the dejecta of patients suffering from intestinal troubles in Bengal." Six cases were observed. There is "a capacious mouth cavity . . . extending to the middle of the body." The organism moves sluggishly. The posterior end of the body is drawn out into a long, thin tail. There is an oblique line across the body, as seen in stained preparations, which "seems to act as an undulating membrane," but "no regular undulating membrane can be made out" in fresh specimens, and no such membrane is seen in the cavity of the cystostome [*sic*].

Anteriorly, there is a vesicular nucleus. Three anterior flagella arise from basal granules, near the nucleus. No division forms and no cysts were found.

The parasite measures 14μ to 18μ in length by 3μ to 6μ in breadth. The flagella measure 8μ to 10μ. The organism is not specifically named. There is a plate of 10 figures.

[It is to be regretted that so much inaccuracy in the names of other workers and in the titles of the journals in which they published should have been overlooked in this and other recent papers by the author. Non-existent journals even have been quoted, when well known ones obviously were meant.]

H. B. F.

MAYER (Martin). **Zur Frage: Emetinbehandlung der Lamblienruhr.** [Treatment of Lamblia Dysentery by Emetine.]—*München. Med. Woch.* 1914. Aug. 4. Vol. 61. No. 31. p. 1733.

The object of this note is to correct the impression conveyed by ASSMY [this *Bulletin*, Vol. 4, p. 318] that Mayer's case for the specific action of emetine on lamblial dysentery is not established. Mayer points out that the case described by Assmy is not clinically the same as the one described by him. Further, the effect of emetine on lamblial dysentery is to be judged, not by the diminution in the number of the parasites, but by the appearance of numerous degenerating Lamblia in the dejecta.

H. B. F.

Mixed and Unclassed Dysentery.

Morison (J.). **The Causes of Monsoon Diarrhoea and Dysentery in Poona. Second Report.**—*Indian Jl. Med. Res.* 1915. Apr. Vol. 2. No. 4. pp. 950–976. With 2 maps and 12 charts.

This is an interesting and valuable contribution to a question which in past years has frequently been the subject of inquiry without any definite conclusion having been reached. For over 30 years during the monsoon, Poona has suffered from a prevalence of gastro-intestinal disease and enteric fever. Formerly it had been regarded as one of the healthiest stations in India.

In 1904 Staff Surgeon Lt.-Col. Bull had reported that the Poona diarrhoea might be traceable to the water supply. "It was a fact that, at the commencement of the monsoon when the large catchment area of Lake Fife (from which the water is taken by canal) is scoured with water which eventually finds its way to the Poona distribution pipes, the annual increase in serious bowel complaints occurs." This statement of Col. Bull is referred to here, as it foreshadows the line along which the present writer has worked. In 1909–10–11 there was a tendency to attribute the prevalence of diarrhoea to flies. Capt. Morison began his investigations in April 1912 and the question was attacked from the epidemiological, clinical and bacteriological aspects. The clinical characteristics of Poona diarrhoea are very variable and, as the outcome of observations over two seasons, the author is inclined to include under this name every form of gastro-intestinal disturbance, from colic and dyspepsia to the most severe types of dysentery, choleraic diarrhoea and jaundice. A clue to the nature of the case distribution was got by consulting the manuscript notes on out-patients at the various hospitals.

Charts are appended showing the course of the epidemic week by week in 1912 and 1913. In 1912 the highest point of the epidemic curves was reached in the second week of July, while in 1913 the curve did not reach its acme till August 6th.

There was no evidence from the records that temperature changes bring the annual epidemic. The humidity curve, however, rose with the cases of diarrhoea but, as the author remarks, the humidity or the rain to which humidity is due has long been regarded as standing in some relationship to the Poona diarrhoea. The question of transmission by milk was enquired into, as there was a popular belief that cows feeding on new grass suffer from diarrhoea and that the milk of such cows may induce diarrhoea especially in children. No evidence in support of milk as the source of infection could be obtained and the evidence in support of flies as carriers of the infection was on the whole inconclusive. "The evidence that in Poona they convey infection to such an extent that they produce the annual epidemic is so hypothetical that it can only be accepted if every other cause is definitely excluded."

Some interesting cases of possible distribution by human carriers were met with but "in none was the chain of evidence complete."

The author then proceeded to investigate the question from the standpoint of the relation of water supply to the distribution of the disease. The only cause common to all classes of patients included in the 1912 records was the drinking water. All received piped water

from Lake Fife. Bacteriological examination of filtered tap water on June 22nd, 1913 gave coliform organisms in 0·01 cc. This filtered supply was taken from the Muttra Right Bank Canal at a point 11 miles from Lake Fife. Where the canal issued from Lake Fife, the water contained coliforms in 0·03 cc. These results were confirmed by estimations of the free and albuminoid ammonia in the water issuing from Lake Fife. Around this lake are 16 villages with a population of over 8,000. Also in the three valleys at the head of the lake are 36 villages the drainage and filth from which enter the upper reaches of the lake, where it collects if the rainfall has only been moderate. Now the flow of the lake depends on the volume of water entering the lake and the volume allowed to escape at the weir. Gauge records at the weir were taken by the irrigation department every morning and it was noted that, as a consequence of rain in the catchment area and therefore of a rise in the volume of water entering the lake, there was a sudden rise in the albuminoid ammonia. This rise announces the arrival of water scoured out from the narrows at the head of the lake. "If now polluted water from Lake Fife is the cause of the epidemic diarrhoea, an increase in the volume of water entering the lake will precede an increase in the cases of diarrhoea in Poona by a definite minimum period" (at least six days). Charts are supplied showing the water levels and the cases of diarrhoea noted on the Wednesday of the week in which they occurred.

These charts require careful study. It is impossible to discuss them here. From a review of the evidence the author reaches the conclusion "that the relation of the sewage pollution of Lake Fife to the epidemics of diarrhoea is so close and so constant that the one stands to the other as a cause to an effect." The remedy for the annual epidemics in Poona is the purification of the water supply. The water during the monsoon is only safe when boiled.

The bacteriological work consisted of examination of stools for flagellates, amoebae, dysentery bacilli and organisms of the typhoid colon group generally and, in the attempt to demonstrate pathogenicity of coliform organisms isolated from faeces, agglutination tests were made with the patients' sera. The results so obtained will be published separately and will be awaited with interest.

J. C. G. L.

FISCHER (Walter). **Ueber Stuhluntersuchungen bei Europäern und Chinesen in Shanghai.** [The Examination of Stools of Europeans and Chinese at Shanghai,]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1914. Sept. Vol. 18. No. 18. pp. 615–634.

The author gives an account of his investigations of stools from Europeans and Chinese in Shanghai. The period covered by the work was January to May 1914. The parasites found included various helminthes (Ascaridae, Trichocephalus, Oxyuris, Strongyloides, *Ancylostoma duodenale*, *Necator americanus*, *Schistosoma japonicum*, *Clonorchis sinensis* and Taeniidae), as well as various Protozoa. Fresh preparations were used, and stained ones when possible.

The protozoal organisms observed were *Balantidium coli*, *Trichomonas intestinalis*, *Prowazekia asiatica*, *Lamblia intestinalis*, *Uronema caudatum*, *Entamoeba histolytica* and *E. coli*.

Balantidium coli was found once in an European who had lived in several tropical countries. It was never found in a Chinese.

Flagellates were found in large numbers in some cases, both European and Chinese. In two cases there was profuse diarrhoea and the stools were very offensive, *Trichomonas intestinalis* being present in enormous numbers. In another case, the stools were less fluid and malodorous, while the trichomonads were fewer in number. The flagellates were probably the causal agents of the disease.

Prowazekia asiatica was present in one case only.

Lamblia intestinalis occurred in large numbers in a Chinese who also was suffering from amoebic dysentery.

Uronema caudatum was observed in the diarrhoeic stool of an European. Two days later, encysted forms only of the Ciliate were found in the stool.

The latter part of the paper deals with *Entamoeba histolytica*. The "tetragena" form is the one constantly encountered in Shanghai. Vegetative (trophic) forms of *E. histolytica* were found in 12 out of 180 cases in Europeans. Cysts only were found 19 times, and on four other occasions they were co-existent with trophic forms. Cysts were also present in 9 out of 100 stools of Chinese. Six cases were cyst carriers.

The two types of carriers described by WALKER and SELLARDS namely, "convalescent carriers" and "contact carriers," are recognised. Direct infection by soiled fingers, as well as by water, needs consideration, but masked cases (contact carriers) are a great source of infection.

The author states that emetine had little or no action on the cysts of *E. histolytica*, though it had a marked action on the trophic phase of the parasite.

Entamoeba coli was found to be relatively rare.

The author concludes with a warning regarding pseudodysentery in neurasthenic persons. Microscopical diagnosis is essential, and should be followed by appropriate treatment when the absence of Entamoebae is established.

H. B. F.

BERTRAND (L.). **Parasitisme intestinal en Cochinchine.** (Note de **M. Noc.**)—*Bull. Soc. Path. Exot.* 1915. May. Vol. 8. No. 5. pp. 245–247.

The author commences by stating that "statistics are the triumph of vice-versa." He cites the statistics relating to liver abscess and dysentery and to amoebic dysentery and anguillulid diarrhoea in Cochinchina in support of his statement. Twenty-five per cent. of the cases of amoebic dysentery are complicated by liver abscess. On the other hand, Bertrand and his colleague, FONTAN, found that 77 per cent. of the cases of liver abscess were preceded by dysentery, coincided clinically with it or showed that it had been present by the intestinal appearance post-mortem. Other workers also have obtained high percentages.

Noc and colleagues found the Anguillula of NORMAND 4 times out of 400 cases of dysentery or diarrhoea in Cochinchina. In each case, the Anguillula was accompanied by amoebae. It might, then, be

considered that there was, in no case, anguillular infestation without concurrent amoebic dysentery. The question to be determined really is whether in Cochinchina there is a chronic diarrhoea due to the anguillulid. NORMAND, who found the anguillula, did not give the percentage of the Cochinchina diarrhoeas which were old dysentery cases, but he recognised the frequency of "mucoso-sanguinolent stools with tenesmus" in the case of the chronic diarrhoeics. These he thought resulted from a colitis, of which he said the agent was the amoeba of the colon.

The author concluded by stating that NORMAND, after LOESCH, was the first person to describe amoebae in dysentery. He depicted them in his account, but referred to them as paramoecia.

H. B. F.

NOC (F.). **Sur le diagnostic des dysenteries et des diarrhées d'Indochine.—Valeur du sérodiagnostic dans les diarrhées chroniques.** —*Bull. Soc. Med. Chirurg. Indochine.* 1915. May. Vol. 6. No. 6. 5 pp.

In the tropics it is often exceedingly difficult to diagnose the exciting cause of the various forms of diarrhoea and dysentery. Particularly is this the case where amoebae, dysentery bacilli, flagellates, ova, etc., are liable to be present and often parasitic in the same host. Some may play a primary and others a secondary rôle. In Saigon one often finds Lamblia cysts or nematodes in diarrhoeal cases, even at the end of the malady when the stools are normal in character. Also one finds dysentery bacilli in cases of amoebiasis which have yielded to emetine. The presence of alterations in the total and differential leucocyte counts is of value but no specific importance can be attached to them.

Although some authors have noted eosinophilia in amoebic dysentery, the author has observed many cases of amoebiasis in which there was no eosinophilia, at least at the commencement of the malady. Agglutination tests are of great practical value, young agar cultures of *B. Flexner* being employed. The agglutinating power of the serum is feeble in acute cases but may be very strong in chronic cases. It is necessary to employ all possible diagnostic methods concurrently, viz., macroscopic and microscopic examination of the stools, search for *B. dysenteriae*, total and differential leucocyte counts, and serological tests (agglutination). It is only by thorough examination of the case from all points of view that the most probable diagnosis can be reached and the best indications for treatment arrived at.

J. C. G. L.

SMITS (Joseph). **Ueber Dysenterie und ihre Behandlung.** [Dysentery and its Treatment.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1915. Apr. Vol. 19. No. 7. pp. 195–210; No. 8. pp. 224–238.

General discourse on dysentery from experience gained in Sumatra. Propagation of the disease by flies is important and the writer states that he succeeded in isolating Shiga-Kruse organisms from flies caught in the neighbourhood of dysentery patients in the dysentery barracks (extract in sterile water of the whole fly). Amoebic dysentery is usually a chronic disease without pyrexia at the commencement, whereas the

bacillary form begins suddenly and runs a course of 15–20 days as a rule whether cure or death results. Complications noted in bacillary dysentery were suppurative parotitis, joint swellings and sometimes suppurative arthritis. Also muscle abscesses have been seen.

A leucocytosis exceeding 25,000 in severe cases of amoebic dysentery is prognostically unfavourable. Liver abscesses should be evacuated. They do not yield to emetin injections. It is possible however that hepatitis in the early stage is arrested by emetin; and he has noted much fewer cases of liver abscess since the introduction of emetin treatment.

Serum treatment should be employed in severe cases of bacillary dysentery. The milder forms of the bacillary infection are cured readily without its aid. In mixed bacillary and amoebic infections combined treatment with emetin and serum has been attempted but not with any striking success.

J. C. G. L.

Noc (F.). **Hygiène et Prophylaxie. Les dysenteries tropicales et leur traitement spécifique.**—1915. Saigon: Imprimerie Albert Portail. 8 pp.

An excellent short pamphlet on the etiology of dysentery for the instruction of the inhabitants of tropical countries. In *Shiga* dysentery energetic treatment by anti-dysentery serum is recommended from the start. The author also believes that in "pseudodysentery," due to the *Flexner* group, dysentery serum is equally efficacious, but frequent injections are necessary. Vaccine-therapy in pseudodysentery (*Flexner*) is favourably commented upon, mixed vaccines (polyvalent) and also autogenous vaccines being employed. He also suggests the possibility of prophylactic vaccination against this pseudo form.

J. C. G. L.

Mathieu (A.). **Traitement des colites dysentériques aiguës ou sub-aiguës.** — *Presse Méd.* 1914. Oct. 15. Vol. 22. No. 71. pp. 645–646.

A note on the specific and non-specific treatment of amoebic and bacillary dysentery. In the latter the beneficent action of anti-dysentery serum is remarkable, especially when the treatment is commenced early. In connection with the non-specific treatment, special mention is made of bowel-washes containing nitrate of silver (0·25 gm.–0·30 gm. to 1 litre of distilled water). Kho-Sam (Kossam) and sulphate of soda are very favourably commented upon. The laxative action of the latter is of very great value where, as so frequently happens, hard scybalous masses occur in the stools along with blood and slime.

J. C. G. L

GHIGOFF (B.). **Ueber die Behandlung der Dysenterie und Cholera mit Natrium sulfuricum.** [The Treatment of Dysentery and Cholera with Sodium Sulphate.]—*Wien. Klin. Woch.* 1915. Aug. 26. Vol. 28. No. 34. pp. 922–924.

The author recommends strongly the use of sodium sulphate in dysentery. He uses a 20 per cent. watery solution containing also opium (either Extractum opii aq. 0·10 to 100 cc. of the solution or simple Tinct. opii, as many drops as there are grammes of sodium sulphate in the solution).

J. C. G. L

ASCOLI (Maurizio). **Sulla Dissenteria.**—*Riforma Med.* 1915. May 8. Vol. 31. No. 19. pp. 505–512.

A comprehensive survey of dysentery in all its aspects. The author thinks the purgative method of treatment is losing ground and that the use of absorbents (animal charcoal or bolus alba) is coming to the front.

Dysentery serum should be used early and generously in grave cases.

J. C. G. L.

SCHMIDT (A.). **Differentialdiagnose der Ruhr gegenüber anderen ähnlichen Darmkrankheiten.** [Differential Diagnosis of Dysentery and Allied Intestinal Diseases.]—*München. Med. Woch.* 1914. Vol. 61. Sept. 22. No. 38. pp. 1982–1983.

Bacteriological examinations of the stools require time while serological tests (agglutination), though capable of being quickly performed, are apt to give doubtful results at the commencement of an infection. Consequently the physician, who must know as soon as possible which cases require isolation, has to rely mainly on the clinical symptoms (character of the stools, tenesmus, etc.).

The diseases which require differentiation are such as acute infectious gastroenteritis (summer diarrhoea, acute paratyphoid infection and cholera nostras). In these the character of the stools is entirely different and tenesmus is not a prominent symptom. More difficult to separate off are the cases of simple non-specific acute colitis or the various forms of ulcerative colitis or acute proctitis.

Generally however such cases occur in isolated fashion and do not give trouble in diagnosis.

J. C. G. L.

BENEKE. **Ruhr mit multiplen Perforationen der Darmwand ohne Peritonitis.** [A Case of Dysentery with Several Perforations of the Bowel and No Peritonitis.]—*München. Med. Woch.* 1915. Vol. 62. No. 5. pp. 158–159.

The patient (female aged 53 years) died in the late stage of dysentery. Ante mortem a " pulsating tumour " was felt in the abdomen in the region of the transverse colon. No symptoms of peritonitis. At the autopsy an extremely severe dysentery of the whole colon and ileum was found. In the colon, only small portions of the mucosa remained.

Great meteorism of the greater part of the large intestine, with numerous tears in the wall so that the intestinal contents lay in immediate contact with the anterior abdominal wall. The bowel was pressed closely against the latter without any peritonitic adhesions or trace of the intestinal contents having escaped. Apparently, during life, the bowel had lain motionless against the abdominal wall. Gas and not faecal matter had come in contact with the peritoneal lining of the latter so that no peritonitis occurred. Cases of this nature are very rare.

J. C. G. L.

DUTCHER (B. H.). **The Failure of Emetine Hydrochlorid, but the Apparent Success of Salvarsan, in a Case of Balantidiosis.**—*Amer. Jl. Trop. Dis. & Prevent. Med.* 1915. Apr. Vol. 2. No. 10. pp. 663–664.

The author, writing from San Juan, Porto Rico, gives an account of an infection with Balantidium in a soldier in the Porto Rican Infantry. Apparently the soldier did not suffer much inconvenience from the parasite. Intermittent treatment with emetine for a period of a month was unsuccessful. Salvarsan was then tried, 0·6 gm. being administered intravenously. During a subsequent period of nine and a half weeks the stools were examined on twenty days, but Balantidia were never found.

H. B. F.

CHOLERA.

JOHNSTONE (R. W.). **Report to the Local Goverment Board on the Progress and Diffusion of I. Plague. II. Cholera. III. Yellow Fever throughout the World during the Year 1913.**—*Rep. to Local Govt. Brd. on Pub. Health & Med. Subjects.*—vi + 110 pp. 1915. London: Printed under the Authority of H.M. Stationery Office.

A thirty-six page cholera report, sixteen of which are devoted to India. At the time of compilation returns for only eleven Indian provinces were available, thus accounting for 245 of the 315 millions of the Indian Empire. In these eleven provinces 296,000 deaths took place during 1913, a mortality of 1·21 per thousand; the mortalities for the two preceding years were 1·71 and 1·48 per thousand respectively, while the average for the last 18 years was 1·73 per thousand with a sum total of over seven million deaths for that period. It is obviously the insanitary way of living and the presence of chronic cholera carriers during the herding together of large numbers of people at fairs and pilgrimages that favour the spread of the disease, all efforts on the part of the government to improve the conditions and to educate the natives as to the dangers they run appearing to have made so far no impression on the mortality statistics. Fly-borne infection is very prominently seen in the Noakhali district (Bengal). A largely consumed article of diet there is sun-dried fish which during the drying process is constantly covered with multitudes of flies. In many parts water from tanks, in which jute has been soaked, is drunk and causes a gastro-intestinal irritation predisposing to a cholera attack. In the same way the large and badly digested meals that follow the long periods of religious fasting render the Mohammedans liable to infection.

The European countries mentioned in the report are Turkey-in-Europe, Greece, the Balkans, Russia and Austria-Hungary. No cases occurred in England; a few were reported on ships bound for this country but arriving here with all on board well.

H. Schütze.

LIVIERATO (S.). i. **Studi e considerazioni dal lato della diagnosi e della profilassi de colera.** [Cholera Studies and Observations from the Point of View of Diagnosis and Prophylaxis.]—*Riforma Med.* 1914. Aug. 22. Vol. 30. No. 34. pp. 932–938; Aug. 29. No. 35. pp. 969–973.

ii. **Forma clinica e terapia specifica del colera.**—*Ibid.* 1915. June 19. Vol. 31. No. 25. pp. 673–679.

i. *Part I* (Aug. 22nd) gives a short system of differentiation between cholera asiatica and other illnesses with similar symptoms, such as cholera nostras, poisoning by various substances—arsenic, corrosive sublimate, toadstools, etc.—trichinosis and malaria perniciosa, and then a full chronological account of the acquirement of knowledge of Koch's vibrio.

Part II (Aug. 29th) treats of the experience of the author gained during the 1913 Balkan war in the central military cholera hospital at Salonika, of which he was in charge. His attention was chiefly given to the relationship of the agglutination phenomenon to the disease in its various aspects. The observations were carried out on

only 147 clinically and bacteriologically diagnosed cases, but the author himself recognised that too much weight could not be placed on the percentages he worked out. Of his 147 cases 74 were severe ones and 73 slight.

Agglutination in general and its frequency.—Of the 133 cases examined 132 gave positive agglutinations; the one negative case died within five hours and thus the test could not be repeated. About 63 per cent. of the cases agglutinated at 1/1000. A few times 1/5000 was reached and was found equally among the slight and severe cases. The lowest titre was 1/500.

Time relationship between appearance of agglutination and onset of disease.—In about 11 per cent. of the 123 cases in which the onset of disease was known, agglutination was positive after a few hours; in about 20 per cent. after 9 days; in the majority, about 68 per cent. after 2–4 days.

Relationship of severity of case to agglutination titre.—

Of 74 severe cases about	23	per cent. had a titre of	1/500.
	63	,,	1/1000.
	11	,,	1/2000.
	2½	,,	1/5000.
Of 73 slight cases about	52	per cent. had a titre of	1/500.
	36	,,	1/1000.
	10	,,	1/2000.
	2½	,,	1/5000.

Height of titre in relationship to length of time elapsed between inoculation and onset of disease.—

Cases with	1/500	titre after	7–88 (average = 60)	days.
,, ,,	1/1000	,, ,,	2–90 (average = 31)	,,
,, ,,	1/2000	,, ,,	15–88 (average = 30–35)	,,
,, ,,	1/5000	,, ,,	15 days (2 cases).	

Titre of fatal cases.—

Of 147 cases 40 were fatal.

52·5	per cent. had titre of	1/500.
42·5	,,	1/1000.
2·5	,,	1/2000.
2·5	,,	1/5000.

Effect of Inoculation on Agglutination.—

Well inoculated cases (43).

About 16	per cent. had titre of	1/500.
74	,,	1/1000.
7	,,	1/2000.
2½	,,	1/5000.

Badly inoculated cases (25), i.e. incomplete number of doses, long intervals between the doses, etc.

About 20	per cent. had titre of	1/500.
68	,,	1/1000.
8	,,	1/2000.
4	,,	1/5000.

Uninoculated cases (49).

About 33	per cent. had titre of	1/500.
65	,,	1/2000.

Persistence of the V. cholerae in the intestine.—Ninety-seven cases examined. About 13 per cent. carried the vibrio for the shortest period, viz. 10–12 days; about 79 per cent. for 13–41 days; only between 2 and 3 per cent. carried for a longer period, the longest being 48 days. A full reference is finally made to the results obtained by other workers on this question of the length of time the *V. cholerae* is passed in the stools of cholera cases.

ii. The clinical symptoms of the disease are first recounted, without contributing anything new, and then after briefly reviewing the older symptomatic cholera remedies the author gives data bearing on the efficacy of antitoxic cholera sera as evidenced by others, and finally writes of his own experience in the use of serum during the same epidemic of 1913 at Salonika.

In nearly all of his 147 cases hypertonic saline injections and cardiac stimulants, when necessary, were given. In some cases cholera serum (Kolle's and from Berne) was used as well. The author expresses his confidence in the value of a cholera serum therapy. Sixty-one severe cases treated with serum had a mortality of 55·74 per cent., while of 17 others equally severe which did not receive serum all died. The author considers promptness of treatment and large doses to be essential. He gave 40–100 cc. intravenously, sometimes two doses on the same day and generally repeated on successive days.

H. S.

NEUMANN (R. O.). **Ueber die Cholerabekämpfung im Rümanien.** [The Anticholera Campaign in Roumania.]—*Arch. f. Hyg.* 1915. Vol. 84. No. 1. pp. 1–53. With 3 sketch maps.

The author, who was in Roumania during the 1913 cholera outbreak and had facilities for travelling and observing the various combative measures employed, gives here a long and somewhat rambling account of what he saw. He worked in the laboratories of CANTACUCINO and BABES in Bukharest, which town owing to the energy and foresight of the authorities was spared the disease very largely. Cholera stools, at times as many as 1,000 per day, were examined by the following emergency method:—A loopful of a peptone water subculture from the stools (24 hours at 37°) is inoculated on to an agar slope, commencing at the bottom of the tube; in this way after six hours' incubation single colonies should have grown on the upper part of the slope and the cholera colonies be distinguishable in the first place by their aspect and in the second place by smear and agglutination tests. It is advisable to use as high-titred a serum as possible. In Bukharest they worked with one positive at 1 : 30,000. Large quantities of cholera vaccine were prepared here, time and trouble being saved by the use of roll-cultures in 5 litre bottles and a standardisation of the emulsion by its opacity. BABES preferred a vaccine prepared from strains selected for their want of toxicity (as evidenced by reaction after inoculation) and for the extent to which they stimulated the production of antibodies. He gave 3–4 mg. of cholera culture for the first dose and six days later 5–8 mg. CANTACUCINO preferred a multivalent vaccine and gave three and smaller doses with intervals of 7–8 days, the total amount inoculated being the same as BABES gave.

As the outbreak came primarily from Bulgaria the chief attention was paid to the frontier line of the Danube. The cholera vibrio was found in the Danube at Nikopoli and other places. As might be expected, more cases occurred along the Danube and other rivers than elsewhere. Very large quarantine stations were established on the Danube at Cimnicea, Turnu-Magurele and Sulina, through which troops returning to their own country after peace had been declared had as well to pass. In these barracks four rows of five huts, each taking 40–50 men, were usually erected, thus giving a row each for the segregation of severe cases, slight cases, convalescents and carriers. Wire gauze windows were extensively employed to lessen the fly danger and lime was freely used on the paths and buildings, both inside and out. Infected material such as bedding, clothes and dressings, was burnt daily, the kitchen and table articles being sterilized.

Surrounded as Roumania was by countries infected and threatening with diseases like cholera, typhus, and plague it was necessary to use very general precautions as well. The entire civil and military sanitary organization came under the control of a central authority, which proceeded to limit traffic with outside countries to a certain few routes and to forbid the importation of vegetables, fruit, or fresh animal foods; all travellers were medically examined and quarantined for five days, those from Russia on account of the danger of plague for ten days. The usual examination and "disinfection" of travellers, as seen by the author in Roumania, Russia, Turkey, Greece, and Italy seemed to be of the feeblest, frequently going no further than a slight "odorising" of the travellers with a carbolic or formalin spray.

H. S.

WEISSKOPF (A.) & HERSCHMANN (H.). **Zur Epidemiologie der Cholera asiatica.**—*München. Med. Woch.* 1915. June 22. Vol. 62. No. 25. pp. 862–864.

Stationed in hospitals at Mitrovica and Sid (Slavonia), the authors had many cases of cholera under their charge. Water as a source of cholera infection could, they decided, be almost entirely excluded, its importance having been greatly exaggerated in the past. All cases were contact ones. The number of carriers was found to be high- of 247 patients at Mitrovica 56 "carried"; on the other hand, unlike in the case of typhoid, the cholera vibrio did not persist long in the intestinal tract. Of the 247 cases 191 were free of the vibrio at the end of illness, 32 carried for 14 days, 24 for 20 days, which shows that the usual five days quarantine without bacteriological examination is no reliable protection. The mortality at Mitrovica was 34 per cent., at Sid 40 per cent. and diminished as the epidemic progressed. Treatment consisted of Bolus alba or Carbo animalis internally and hypertonic saline injections. Tincture of iodine was not found to quell vomiting, nor did MOLDOVAN's cholera vaccine appear of use, but the number of cases so treated was small (24). For diagnostic purposes the type of stool offered no help; with regard to media, occasionally direct plating on to Dieudonné gave a positive result while peptone water enrichment returned a negative. Dörr's dried medium had the great advantage of being ready for use a few hours after its preparation and, while not as selective as the ordinary Dieudonné, still presented no

difficulties in the differentiation of *V. cholerae.* Suspected colonies were diagnosed by agglutination with a high titred serum. Inoculation results were as follows :—

192	cases	(not inoculated)	had a mortality of	39·1	per cent.
41	,,	(inoculated once)	,, ,, ,,	17·1	,,
14	,,	(inoculated twice)	,, ,, ,,	14·3	,,

[As however inoculation was only begun after the commencement of the outbreak and the severity of the epidemic diminished with its progress, these figures naturally exaggerate the influence of the treatment.] H. S.

WEISSKOPF (A.). **Ueber eine Choleraepidemie in M. im Dezember 1914 bis Januar 1915.** [A Cholera Epidemic in M. from December 1914 to January 1915.]—*Wien. Klin. Woch.* 1915. Apr. 8. Vol. 28. No. 14. pp. 385–386. With 1 chart.

On cholera appearing in M. where soldiers were quartered, immediate and energetic measures to combat it were taken; e.g. a hospital for cholera cases and suspects was established outside the town; the streets where these occurred were isolated and the inhabitants warned of the danger of intercourse with the troops; a special cholera transport service was arranged; streets and yards were liberally sprayed, almost flooded with lime; disinfectants for use on hands stood in front of all latrines and closets; to keep the men from drinking possibly contaminated water, coffee and tea were supplied freely at all times; the medical authorities visited all men twice a day and inspected general arrangements every day; the washing of hands before meals and the boiling of table ware was ordered. Prophylactic inoculation was begun on the day following the appearance of the disease and the second dose had been given to all by the 9th day.

H. S.

MADDOCK (C.). **Report and Statistics of the Cholera Epidemic in the Ahmednagar District for the Years 1912 and 1913.**—*Indian Med. Gaz.* 1915. Vol. 50. No. 7. pp. 255–257.

In the Admednagar district during 1912 and 1913, 443 towns and villages were affected by the cholera epidemic and among 900,000 odd inhabitants a case rate of 1·75 per cent. and a death-rate of 0·84 per cent. ensued.

Potassium permanganate pills were given according to ROGERS and to all patients but those who refused treatment; the results may thus be regarded as based on unselected cases. The statistics for the whole district were as follows :—

4,574	cases treated with potassium permanganate pills,	mortality = 35·57	per cent.
11,599	cases not so treated .. ,,	= 51·64	,,

Still better results are shown by the cases that came directly under the care and control of the medical officers in charge of dispensaries.

Here 423	cases treated with potassium permanganate pills,	mortality = 21·98	per cent.
60	cases not so treated .. .. ,,	= 60·0	,,

The author found the "pinking" of suspected wells with potassium permanganate of considerably efficacy in preventing the spread of the disease. H. S.

WIENER (E.). **Zur Symptomatologie und Therapie der Cholera.** [Cholera Symptoms and Therapy.]—*Wien. Klin. Woch.* 1914. Vol. 27. No. 50. pp. 1605–1607.

An account of some less frequently described symptoms, observed in epidemics at Alexandria, El Tor, and Calcutta. The author considers them the results of toxosis and classifies them (1) as nervous: cramps in the flexor muscles of the upper arm; pains symmetrically disposed in the lower limbs (occasionally in the upper limbs as well) beginning in the toe-tips and extending along the sides to the dorsal and sometimes plantar surface of the foot; (2) as vascular: injected conjunctiva; (3) as dermic: trophic lesions of the skin of the lower limbs, from slight peeling to gangrene with loss of both feet; rashes, chiefly urticarical.

In therapy the author follows ROGERS, recommending however hydrogen peroxide 1–3 per mille to be given as a drink in place of potassium permanganate. H. S.

ROGERS (Leonard). **The Results of the Hypertonic and Permanganate Treatment in 1000 Cases of Cholera; with Remarks on the Value of Alkalies in the Prevention of Uraemia and the Rôle of Atropine.** —*Lancet.* 1915. July 31. pp. 219–223.

In this paper the author brings up to date the mortality results obtained from his cholera wards under his largely physiological methods of treatment, viz., the combined hypertonic saline and permanganate therapy, and shows a steady decrease in the death-rate, which has now fallen to almost one-third of what it was before the author introduced his treatment in its various stages.

TABLE I.

Results of the Hypertonic and Permanganate Treatment of Cholera compared with Former Methods.

Years.	Cases.	Deaths.	Mortality.	Recoveries.
	Rectal and Subcutaneous Salines.			
			Per cent.	Per cent.
1895 to 1905 ..	1,243	783	59·0	41·0
	Normal Salines Intravenously.			
1906	112	57	51·9	49·1
	Rectal and Subcutaneous Salines.			
1907	158	94	59·5	40·5
	Hypertonic Salines Intravenously.			
1908 to 7–1909 ..	294	96	32·6	67·4
	Hypertonic Salines plus Permanganates.			
8–1909 to 12–1912	436	124	28·4	71·6
1913	200	49	24·5	75·5
1914	222	49	22·1	77·9
1915 to June ..	145	29	20·0	80·0
8–1909 to 6–1915	1,003	251	25·0	75·0

Table II. is one of age-mortality and demonstrates the great vulnerability of ages below 5 and above 40 years. Collapse at these ages is rarely treatable with success owing to the patients' lack of resisting power, but the author hopes for better results on giving slow continuous subcutaneous injections of hypertonic saline by means of a thermos flask and on giving glucose enemata as a means of supplying the patient with foodstuff.

TABLE II.

Age Mortality under the Old and the New Treatments.

Age.	Old system 1895–1905. Cases.	Deaths.	Per cent.	New system 1913–15. Cases.	Deaths.	Per cent.	Reduction of mortality.
To 5 years	36	19	52·8	22	8	36·3 } 21·7	61%
5 to 10 years				24	2	8·33	
10 ,, 20 ,,	150	80	51·3	121	17	14·0	73%
20 ,, 30 ,,	468	274	58·5	197	44	22·3	64%
30 ,, 40 ,,	273	174	63·7	134	28	20·9	67%
40 ,, 50 ,,	111	77	69·4	43	16	36·5	47%
Over 50 ,,	38	28	73·7	23	11	47·8	35%

Table III.

Analysis of the Remaining Causes of Death from Cholera from 1912 to 1915.

Year.	Collapse.			Uraemia.					Other Causes.							Total admissions.	Total deaths.	Recoveries.	Deaths.
				Day of admission.															
	No.	Percentage.		First day.	Second day.	Later.	Total cases.	Percentage.		Cardiac failure.	Pneumonia.	Hyperpyrexia.	Septic, &c.	Total cases.	Percentage.				
																		%	%
1912..	22	12·94		15	4	5	24	14·1		1	3	2	2	8	4·7	170	54	68·23	31·7
1913..	24	12·0	10·64	11	2	4	17	8·5	11·1	2	4	2	–	8	4·0	200	49	75·5	24·5
1914..	17	7·66		11	5	9	25	11·2		2	2	–	3	7	3·15	222	49	77·9	22·1
1915..	15	10·34		2	1	2	5	3·4		2	5	–	2	9	6·2	145	29	80·0	20·0

TABLE IV.

The Alkalinity of the Blood in Cholera.

Alkalinity.	Recovered.	Died from			Total deaths.	Total cases.	Mortality.	Percentage.	
		Collapse.	Uraemia.	Other causes.					
N/35 to N/45	3	1	–	–	1	4	25%	6·4	
N/45 to N/60	12	2	–	1	3	15	20%	24·2	
N/60 to N/80	18	3	–	3	6	24	25%	38·7	69·4
N/80 to N/100	8	3	–	1	4	12	33%	19·4	
N/100 and over	2	–	5	–	5	7	71%	11·3	

Table III. gives particulars as to the various causes of death, and under the following headings the author discusses the analysis.

Collapse is no longer the chief cause of death. Hypertonic injections should be persisted with and as much as 34 pints in the course of a few days have been necessary for success. The most difficult cases are those in which a relatively low specific gravity of the blood (1,057 instead of the usual 1,064 or more) indicates that an anaemic and generally poor condition of health existed before the onset of the cholera attack and that the patient will probably not possess sufficient recuperative power to pull through.

Uraemia. One third of the cases are the result of the suppression of urine for two or more days; these are very difficult to deal with, owing to proper treatment not having been applied in the earlier stages. The remainder are cases in which in spite of repeated injections the blood pressure cannot be kept high enough (100 mm. and over) to allow of proper renal action. The author used to consider this due to a vaso-motor paralysis but the success of the new treatment by injection of alkalies points to its being the result of an acidosis. Table IV. summarises an investigation into the alkalinity of the blood in relationship to mortality rate and especially death from uraemia. It is seen that, as had been previously suggested by SELLARDS, an acidosis exists more particularly in the severe cases.

The treatment adopted by the author in all early cases requiring a second saline injection, and straight away in cases admitted late with diminished renal secretion, was to inject "one pint containing 60 grains of sodium chloride and 160 grains (2 per cent.) of sodium carbonate, and to continue the transfusion with hypertonic saline up to the required total amount as judged by the specific gravity of the blood. The same procedure was repeated at each subsequent intravenous injection. The amounts of sodium bicarbonate injected in different cases in this manner varied from 160 grains up to 1,120 grains in those who recovered, while in no less than five successful cases 800 or more grains were injected before free secretion of urine was obtained."

The results have been very successful and are shown in Table III, the uraemia mortality of 11·1 per cent. for 1912–1914 being reduced to 3·4 per cent. for 1915. Cases of threatened post-choleraic uraemia, where although renal secretion may be re-established the patient develops boils and bed sores and dies, have shown themselves to be due to acidosis also. The author recently saved two cases with the bicarbonate treatment, a success which had previously never been attained.

Pneumonia. "A septicaemic manifestation of the disease occurring in very severe cases. During the last four years it has caused 1·9 per cent. of the mortality or about 1/10th of the whole."

Cardiac failure and exhaustion caused 1 per cent. of the mortality.

Hyperpyrexia. Less frequent now than before the introduction of intravenous injections.

In some 75 cases the author, following a suggestion of Lauder BRUNTON'S, tried the use of atropine in cholera cases, the reason for the suggestion being that atropine combats muscarine poisoning symptoms, which resemble those of cholera greatly.

He gave it hypodermically in doses of 1/100 gr. for adults morning and evening, alternate cases being omitted from this treatment to

serve as controls. Table V shows, as far as can be judged from the number of cases, with what success the method was attended, death from collapse being particularly guarded against.

TABLE V.

Atropine Hypodermically in Cholera.

	Recovered.	Died from			Total deaths.	Total cases.	Deaths. %
		Collapse.	Uraemia.	Other causes.			
Atropine ..	67	3	2	3	8	75	10·7
No atropine	57	9	3	6	18	75	24·0

H. S.

WHYTE (G. Duncan). **The Treatment of Cholera by Hypertonic Saline Solutions during an Epidemic at Swatow, South China.**—*Brit. Med. Jl.* 1915. Sept. 18. pp. 425–429. With 2 charts.

A practical account of the application of ROGERS's hypertonic saline treatment in cholera. In testing the specific gravity of the patient's blood at the bedside, the author made use of mixtures of two oils, such as oil of wintergreen and castor oil, in various proportions as standards into which drops of blood were allowed to fall. A specific gravity below 1·062 requires no injection, between 1·062 and 1·066 about 80 oz. should be sufficient and over 1·066 about 120 oz. A sphygmomanometer was used for registering blood pressure, the author agreeing with ROGERS that anything below 70 mm. of mercury indicates some degree of cardiac failure and the necessity for saline injections. The diastolic pressure, as being the more important, should be estimated as well as the systolic; it is misleading to regard the difference between the two as always about 30 mm. In cases of aortic incompetence, for instance, it may be much greater, the good systolic pressure giving a false sense of security. In cases of low blood pressure in which the specific gravity of the blood remained low, vasoconstrictors were administered. The author considers that "the almost routine use of calomel in doses of $\frac{1}{6}$ grain every hour" prevent the occurrence to any extent of nausea and vomiting.

The mortality amongst treated cases was as follows :—

60 per cent. for the 15 cases between 1 and 10 years of age.
23 ,, ,, 189 ,, ,, 10 and 60 ,, ,,
63 ,, ,, 8 ,, over 60.

The main causes of death were collapse, hyperpyrexia and uraemia. With regard to collapse, constant attention to the patient's blood pressure is necessary; visits should be paid twice a day. To avoid hyperpyrexia as far as possible, it is necessary to use saline solution not only sterile but also not contaminated with dead organisms, which

of themselves can cause a rise in temperature. The saline must also not be too concentrated or an osmotic reflux of toxin laden fluid may take place from the intestine. In febrile patients the injections should preferably be of a temperature between 70° and 80° F. In the treatment of uraemia, it is necessary to maintain a raised blood pressure and a diminished concentration of the blood by means of saline injections and to relieve congestion of the kidneys by cupping.

H. S.

SAVAS (C.). **Die Serumbehandlung der Cholera in Griechenland.** [The Serum Therapy of Cholera in Greece.]—*Therap. Monatshefte.* 1914. Oct. Vol. 28. No. 10. pp. 653–656.

A compilation of the opinions of a number of Greek doctors on the value of serum therapy in cholera during the epidemic which broke out in Greece during the 1913 Balkan campaign after a period of 65 years of quiescence. It was difficult to assess the real value of the remedy, seeing that it always went hand in hand with other measures of recognised efficacy. The serum was obtained from the Pasteur Institute in Paris, from Berne, Vienna and Dresden, no difference in the various samples being remarked, and was given generally intravenously, sometimes mixed with the saline injection, and in doses varying from 10–100 cc.

The opinions of the following are quoted :—

Dr. ANTONOPOULOS in Salamis and Dr. METAZAS with the soldiers of the V division [? number of cases] saw no good result follow the treatment.

Dr. PRINKOS (75 cases) was strongly in favour, if the serum can be given early in the disease ; a delay of 24 hours after the onset of the symptoms may render it useless.

Dr. TSALAS gave 40 cc. intravenously and on successive days with good results.

Dr. LEFAS (29 cases) considered that when serum is combined with other remedial measures and is given intravenously, the effect is marked. In a number of his cases treated with serum given intravenously the mortality was 22·5 per cent. ; in others where the serum was administered subcutaneously the mortality was 41·3 per cent. (In the following places—Arta, Trikkeri, Salamis, Tzajesi-Stavros and Salonika—where no serum was used, the mortality varied between 40 per cent. and 60 per cent.)

In the Salonika hospital for infectious diseases large doses of cholera serum, even up to 100 cc., were much used. Fifty cc. seemed to give the best result ; the large doses (100 cc.) though producing no particularly unfavourable symptoms proved less effective. Occasionally slight anaphylaxis developed on repeating the injection. Dr. LIVIERATOS (147 bacteriologically and clinically diagnosed cases) treated 73 with serum (40–80 cc. doses ; sometimes repeated). Of these 61 were severe cases and had a mortality of 55·7 per cent. ; 12 were slight cases, none dying. The remaining 74 were treated without serum and of the 17 severe cases none survived, while none of the 57 slight cases proved fatal. He considered large doses of serum the most effective.

Savas summarises as follows: Cholera serum given intravenously sufficiently early in the disease and in combination with saline injections is apparently productive of good results in many cases.

All workers found Iodine tincture as an internal medication of no use.

H. S.

NAAMÉ. **Le traitement du choléra par l'adrénaline.**—*Presse Méd.* 1914. Dec. 10. Vol. 22. No. 79. p. 725.

The author claims striking results for an adrenaline therapy in cholera, giving 4–6 mg. per day subcutaneously for several days together with saline intravenous injections. He considers the cholera toxins to have an elective action on the suprarenal capsules and regards the disease as consisting of two forms, a more or less harmless intestinal form and a more dangerous suprarenal form, manifesting itself simply as a "toxic hypoepinephritis." The great tolerance shown by the cholera patient towards adrenaline should be accepted as a sign that an active principle, which the disease is destroying, is being restored to the organism.

H. S.

MARCOVICI (Eugen) & SCHMITT (Max). **Zur Therapie der Cholera asiatica.**—*Wien. Klin. Woch.* 1915. Aug. 19. Vol. 28. No. 33. pp. 894–896.

MARCOVICI's success in the treatment of dysenteries with allphen, a garlic-salol preparation, led to its being used in some 24 cases of cholera. Twelve 0·5 tablets were given per day after food or, if there was vomiting, after the administration of chloroform water, which in doses of 4–5 teaspoonsful per day was found effective in suppressing the vomiting. High enemata (1–1½ litres containing 20 gm. allphen per litre) were also given once or twice a day. The authors report favourably of the treatment and suggest that bactericidal, perhaps also antitoxic, disintegration products are formed in the intestine.

H. S.

DITTHORN (Fritz) & LOEWENTHAL (Waldemar). **Zur Technik der Cholera- und Typhusimpfstoffherstellung in Grossen.** [The Technique of the Preparation on a Large Scale of Cholera and Typhoid Vaccine.]—*Deut. Med. Woch.* 1915. Aug. 19. Vol. 41. No. 34. pp. 1006–1008. With 3 figs.

A detailed account of the method followed by the Berlin Untersuchungsamt in the preparation of cholera vaccine. The vaccine, as is usual in Germany, was standardised by reckoning the loops per plate of culture and emulsifying so as to give 2 loops per cc. Standardisation by comparison of opacity was regarded as difficult owing to the differences in colour of emulsion that various cultures gave. Sterilisation took place in small quantities of 90 cc. In 10 minutes the emulsion had reached the temperature of the water bath (54° C.); one hour at this temperature was allowed for the killing of a cholera emulsion. If flasks containing large quantities such as 2 litres were used, the authors found that it took an hour to raise the temperature from 21°–54° and considered that this longer period in the water bath

might be detrimental. The vaccine was supplied in bottles with either rubber or glass stoppers. Owing to a shortage of rubber, bark corks were often used, being sterilised as follows:—Soaked in xylol for 24 hours; then in paraffin (melting point 45° C.) and heated to 200°–210° C. The paraffin penetrates for 1–2 mm., renders the corks elastic and gives a good stopping and sterile surface. In order to economize in cotton wool, bottles are now sterilised without cotton-wool pluggings, the mouths of the bottles being covered by overhanging glass lids instead.

H. S.

FISCHER (Bernhard), BITTER (Ludwig) & WAGNER (Gerhard). **Vereinfachung und Verbilligung der Herstellung von Choleraimpfstoff.** [The Simplification and Cheapening of the Preparation of Cholera Vaccine.]—*München. Med. Woch.* 1915. June 8. Vol. 62. No. 23. pp. 770–773. With 2 figs.; June 15. No. 24. pp. 813–814. With 1 fig.

In an effort to simplify and cheapen the production of cholera vaccine on a large scale, the authors had recourse to tin dishes in place of test tubes, Petri dishes and Roux bottles, and to yeast agar instead of the usual nutrient agar. By this means the laboratory was easily able to cope with 80 litres of vaccine per day, whereas before adopting the change 10–20 litres were with difficulty managed. The tins had been made for the fish preserving trade, were roughly 6 × 4 × 1 inches in size and owing to their shape [see Fig. 1]

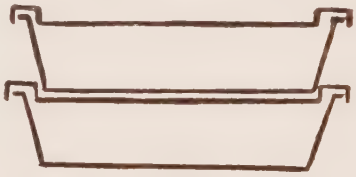

Fig. 1. Tins for Production of Cholera Vaccine.

could be packed one on top of the other, thus economising room in the sterilisers and incubators. Rusting rendered them useless after having been used six times, but they lasted for all that longer than the average Roux bottle and were more cheaply replaceable. Other advantages were the greater ease with which the emulsion could be poured from the tin dish than from an ordinary Petri dish and the constant size, so that when standardising the vaccine by the surface of growth emulsified calculations were much simplified. (The author found that the amount of a 24 hours agar culture necessary in their case to produce a vaccine containing the requisite 2 standard loops —4 mg.—of culture per cc. was 2 square centimetres).

The yeast agar was made from a preparation of yeast which was on sale as a food and had been washed, rendered non-bitter and dried. Ordinary non-bitter brandy yeast might have been equally well used, but was slightly more expensive and contained a varying amount of water. The medium consisted of yeast (3 per cent.), sodium chloride and agar autoclaved and titrated in the usual way. It gave as good results as ordinary agar and cost but one-fifth. The opacity of both dish and medium was of no importance in vaccine preparation.

A convenient apparatus is illustrated in Fig. 2 by means of which specific quantities of the finished vaccine may be supplied rapidly and with sterility. It is the lower end of a siphon or the direct outlet from the flask containing the vaccine; the additional calibrations at 55 and 22 cc. allow of 10 per cent. surplus being put into the vials, thus compensating for the amount that is lost by wastage when inoculation takes place; no doubt a cotton wool filter would be necessary at the air vent in the upper part of the apparatus.

Fig. 2.

Apparatus for Supply of Cholera Vaccine.

The question of sterilization of the vaccine is considered. The authors found the temperature chosen (53° C.) did not suffice to sterilize with certainty typhoid or even cholera vaccines in $1\frac{1}{2}$ hours or paratyphoid in 24 hours. According to FORNET a raised temperature for killing causes an increased inoculation reaction and 24 hours at 53° C., while still being uncertain as regards sterilizing the emulsion, might easily result in a considerable growth of any thermophilics present. Even after two hours at 53° the authors found that contamination by thermophilics occasionally resulted. They propose therefore the use of hydrochloric acid as disinfectant. A quarter of an hour of 0·136 per cent. HCl is very effective and the acid can then be neutralised by the addition of NaOH.

H. S.

OTTOLENGHI (D.). **Per la preparazione del vaccino anticolerico.** [The Preparation of Cholera Vaccine.]—*Policlinico.* Sez. Prat. 1915. Aug. 8. Vol. 22. No. 32. pp. 1057–1059.

A short account with *no details* of an experimental investigation on the efficacy of cholera vaccines killed by the following methods—(1) cholera cultures autolysed at 37° and subsequently filtered; (2) killing by heating to 60° or 53° for one hour; (3) killing by ether in liquid or vapour form. All the vaccines were of the same strength and age; one inoculation, seven days previous to the investigation, was given, the experimental animal being the rabbit.

It was found (*a*) that no superiority could be discerned in any of the methods with regard to the formation of agglutinins and bacteriolysins, as shown by *in vitro* experiment; in every case they were abundantly produced; (*b*) that while the vaccine killed with ether vapour produced a serum which failed to protect guinea-pigs against a lethal dose of cholera vibrios, the other vaccines gave rise to serum with excellent protective powers; (*c*) that agglutinins persist to a marked degree and bacteriolysins to a somewhat less degree in animals inoculated with vaccines killed by heat or ether vapour, vaccines differently treated not giving such good results. Therefore killing by heat is not only the simplest but the best method, 53° being a better temperature than 60°. The author gave 1 cc. doses, beginning with 500 or 1,000 million for the first and reaching 2,000 million for the third. There was no marked local or general reaction.

H. S.

SOLTMANN (Heinz). **Die Prüfung der zur Schutzimpfung gegen Cholera hergestellten Impfstoffe.** [The Testing of Cholera Vaccines.]—*Zeitschr. f. Hyg. u. Infektionskr.* 1915. Aug. 18. Vol. 80. No. 2. pp. 323–344.

In the main a consideration of the best method of standardizing cholera vaccines. Some in Germany prepare cholera vaccines by reckoning the loops per surface area, 10 loops going to a slope, 66 to a certain sized Petri dish and so on; others weigh the growth, carefully removed from the agar surface, reckoning 2 mg. to 1 loopful, which is the unit of dosage. This latter more laborious way was not found to be more exact than the simpler first-mentioned one. In reviewing the accuracy of these two methods the author made use of the Thoma-Zeiss counting cell for enumeration purposes. This direct counting was more exact, though not so convenient as the comparison of opacity with a standard emulsion, and very much more exact than either WRIGHT's blood corpuscle method or the plating out method.

H. S.

REMBOLD. **Ueber den Keimgehalt von Cholera- und Typhusimpfstoffen.** [The Bacterial Contents of Cholera and Typhoid Vaccines.]—*München. Med. Woch.* 1915. July 27. Vol. 62. No. 30. pp. 1005–1006.

While examining some cholera vaccines with abnormal inoculation reactions the author discovered a great divergence in opacity in the various samples, the extremes being as 1:7. He attributed this

chiefly to the German method of standardising vaccines by the number of loops of culture per cc. The method depends on the false assumption that in equal times on equal agar surfaces equal numbers of cholera vibrios will grow. The author suggests an opacity standardization as a rapid and more reliable method, using as standard a counted cholera emulsion or, better still, a suspension of some white inorganic powder which will keep indefinitely.

H. S.

ARONSON (Hans). **Eine neue Methode der bakteriologischen Cholera-diagnose.** [A New Method for the Bacteriological Diagnosis of Cholera.]—*Deut. Med. Woch.* 1915. Aug. 26. Vol. 41. No. 35. pp. 1027–1029; Sept. 9. No. 37. p. 1088.

This method which, the author declares, reduces the bacteriological diagnosis of cholera to the simplest of tasks, is based on a combination of the selective value for *V. cholerae* of an alkaline reaction in the culture medium, and the efficiency as indicator of the fuchsin-sodium sulphite compound, as present in Endo's medium, when sugar, in this case cane sugar and dextrin, is split by the action of the cholera vibrios.

One hundred cc. of hot liquid 3·5 per cent. agar, prepared as usual with Witte peptone and meat extract and in a 200–250 cc. flask, is treated as follows:—6 cc. of 10 per cent. Sod. Carb. sicc. is added. It is then steamed at 100° for 10–15 minutes. While still hot are added:—

5 cc. of 20 per cent. cane sugar.
5 cc. of 20 per cent. dextrin.
0·4 cc. of saturated alcoholic fuchsin solution.
2 cc. of 10 per cent. sodium sulphite.

The precipitate settles rapidly and from the supernatant fluid plates are poured, which after drying ½ hour at 50° C. in an inverted position are ready for use and may be kept for a few days by storing in the dark.

On this medium *V. cholerae* develops well in 10 hours, but it is not till after 15–20 hours, when the colonies are considerably larger, that they acquire the ultimate strong red colour. Organisms of the coli group are more or less totally inhibited. The various additions to the nutrient agar may be kept ready made up, all but the sod. sulphite being indefinitely durable.

The author was only able to test his medium in one case of cholera, the result being as strikingly good as in the laboratory experiments.

He found it possible to put up the various ingredients, dry, mixed and as tablets, thus requiring only their solution in ordinary nutrient agar for the preparation of his selective medium, a simplification very desirable in a field laboratory.

H. S.

JACOBITZ. **Cholerauntersuchungen.** [Cholera Diagnosis.]—*Cent. f. Bakt.* 1. Abt. Orig. 1915. May 20. Vol. 76. No. 2/3. pp. 97–108.

An account of 395 examinations carried out in Beuthen, Upper Silesia, between November 5th, 1914 and January 31st, 1915. After

the first few cases, which appeared to originate without relationship to one another, and as the later ones multiplied, a simplified plan of examination was devised.

I. From the original material sent in were prepared :—

(*a*) a peptone water culture (Examination after 6, 12, 18, 24 hours).
(*b*) 2–3 alkaline agar plates } Examination after 12, 18,
(*c*) a blood alkali plate } 24 hours.

II. From the peptone water culture is prepared after 6 or 12 hours :—

(*a*) 2–3 alkaline agar plates } Examination after 12, 18,
(*b*) a blood alkali plate } 24 hours.
(*c*) if necessary a second peptone water culture.

III. Agglutination test with a high titred serum.

Pfeiffer's test was not considered necessary for the later cases. Often enough the plates prepared from the original material gave such well grown cholera colonies that the agglutination test could be immediately carried out. Only rarely had one to wait 24 hours before seeing motile rods in the peptone water culture, which was the indication for plating out, and very rarely indeed were the motile rods so few in numbers that it was necessary to inoculate a second peptone water from the first. Generally attention was paid to the possibility of the case being one of typhoid or dysentery, and not cholera at all, by plating from the original material on to litmus-lactose and Loeffler's green agar.

Blood cultures were made from five cholera patients and seven post-mortem cases. The blood was inoculated with or without an equal quantity of bile in peptone water at 37° and examined repeatedly after from six hours up to 10 days. In none of the bloods taken from living patients was *V. cholerae* found. In two of the seven post-mortem cases the result was positive. H. S.

Baerthlein (Karl) & Gildemeister (E.). **Ueber Choleraelektivnährböden.** [Selective Cholera Media.]—*Cent. f. Bakt.* 1 Abt. Orig. 1915. Aug. 25. Vol. 76. No. 7. pp. 550–607.

Taking into account Haendel and Baerthlein's investigation into the relative merits of various cholera media published in 1912 [this *Bulletin*, Vol. 1, p. 208], the authors chose Dieudonné's and Pilon's media for renewed examination, comparing them with the more recent ones of Kabeshima and of Hofer and Hovorka. (The Pilon modification of Dieudonné by substituting sod. carb. for caustic potash and by the use of defibrinated pig's blood approaches Dieudonné in selective power and surpasses it in being immediately ready for use). Kabeshima used like Pilon sod. carb. in place of caustic potash, but replaced the blood by an easily soluble haemoglobin preparation. Hofer and Hovorka's modification consists essentially in the addition of crystal violet. The comparative tests were carried out with (*a*) freshly isolated cholera strains, (*b*) strains of cholera-like vibrios, Alcaligenes, Proteus and Pyocyaneus, (*c*) cholera and cholera-carrier stools, (*d*) *V. cholerae* free stools from typhoid and dysentery cases and from *V. cholerae* free cholera convalescents and carriers. In this

way some 241 samples were tested on the four media and after finally investigating with over 200 samples and on similar lines a new modification of Kabeshima devised by themselves, the authors sum up as follows :—

1. Pure cultures of *V. cholerae* grew in 16–18 hours on Kabeshima excellently, on Dieudonné and Pilon well, on Hofer-Hovorka hardly at all.

2. Pure cultures of cholera-like vibrios grew on Dieudonné, Pilon, and Kabeshima but not as well as the true Koch bacillus ; on Hofer-Hovorka growth rarely occurred.

Alcaligenes in pure culture generally grew on Dieudonné and Pilon well, on Kabeshima less often and then but poorly, on Hofer-Hovorka not at all.

Pure cultures of Pyocyaneus and Proteus grew, the former constantly but poorly, the latter rarely, on Dieudonné, Pilon, and Kabeshima ; neither developed on Hofer-Hovorka.

3. Cholera and cholera-carrier stools gave always a positive result on Dieudonné and Kabeshima, while on Pilon there were occasionally, and on Hofer and Hovorka generally, negative results.

4. Using cholera and cholera-carrier stools the *V. cholerae* was obtained in pure culture from the plates on Kabeshima in 54·7 per cent., on Dieudonné in 55·6 per cent., on Pilon in 57·5 per cent of the cases. Neglecting the occurrence of small coccal colonies the following types were found also growing on the plates—Alcaligenes on Dieudonné in 25·7 per cent., on Pilon in 26·6 per cent., but on Kabeshima in only 4·75 per cent. of the cases. Occasional colonies of Proteus, Pyocaneus and Dysenteriae were met with on the same media. On Hofer and Hovorka all three accompanying bacteria were suppressed.

5. Using typhoid and dysentery stools the plates were either sterile or showed small coccal colonies with Dieudonné and Pilon in 82 per cent., with Kabeshima in 90 per cent. of the cases. Alcaligenes was found on Dieudonné in 15 per cent., on Pilon in 13 per cent., on Kabeshima in 6 per cent. Other bacteria were almost or entirely suppressed. On Hofer and Hovorka beyond cocci in four cases nothing grew at all.

6. Dieudonné is thus to be regarded as satisfactory, its drawbacks being that it is not immediately ready for use and that Alcaligenes grows somewhat too freely on it.

Pilon equals Dieudonné in being suitable for the growth of *V. cholerae* and in its selective power, but occasionally fails.

Kabeshima is particularly good. In most things equal to Dieudonné, it surpasses that medium in being immediately ready for use, made of easily obtained ingredients (haemoglobin), easily prepared and a good inhibitor of Alcaligenes.

Hofer and Hovorka proves unsatisfactory.

7. Kabeshima however possesses the drawbacks of not being durable owing to the impossibility of sterilising the haemoglobin extract, and of not having a constant alkalinity owing to the instability of the crystalline carbonate of soda. The authors obviate these difficulties by adding the smallest necessary amount of caustic soda to the haemoglobin extract before sterilising, adding then the complementary amount of sodium carbonate in the form of a 5·5 per cent. solution of a waterfree sample of the salt.

8. This modification of Kabeshima's medium is ready for immediate use, will keep about two weeks and favours the growth of *V. cholerae* to the same degree as the original Kabeshima. Alcaligenes is apt to grow somewhat more freely ; in this it approaches Dieudonné.

9. This medium is prepared as follows :—

3½ gm. haemoglobin extract are dissolved in 10 cc. physiological saline, 10 cc. of a 5·5 per cent. solution of water free sod. carb. and 2 cc. caustic potash are added and the mixture is sterilised in steam for ¼ hour. On cooling to below 50° C. 80 cc. of a 3 per cent. agar, neutral to litmus and at 80–90° C., are added ; after mixing plates are poured and, the condensation water having been evaporated in the incubator, are ready for use, any precipitate that may form being of no account.

H. S.

Otto (R.). **Ueber die Durchführung von Massenuntersuchungen auf Cholerakeimträger.** [The Examination of Suspected Cholera Stools on a Large Scale.]—*Cent. f. Bakt.* 1. Abt. Orig. 1915. July. Vol. 76. No. 5. pp. 392–400. With 6 figs.

A description of the method worked out by the Institut für Infektionskrankheiten, Berlin, for the examination of thousands of suspected cholera stools per day. A list of the personnel, materials and apparatus needed to undertake 10,000 stools daily is given, the number of people employed being calculated at 35 (only three necessarily doctors with bacteriological experience and six trained laboratory attendants) against at least 85, if the labour-saving devices here advocated are employed. The actual method of diagnosis is the usual one of enriching in peptone water for 16–20 hours, and plating on to Dieudonné with an agglutination test of suspected colonies appearing on the plates the following day, a return being thus usually possible within 48 hours.

The primary labour-saving device is the use of special boxes for the transport of the stool specimens, fitted with racks that can be lifted out of these boxes and contain the specimens in small test tube-like vessels each corked and containing a small metal spoon, which according to instructions given holds the amount of stool needed for examination. The enrichment process is carried out in these same glass vessels by running into each 10 cc. of peptone water from a large burette-like receptacle.

With the very large number of such racks as will be needed, naturally ordinary incubators are useless and the author recommends heating an ordinary laboratory room, whose doors and windows close tightly, with one or more gas ovens fitted with automatic regulators.

Agglutinations are carried out in drops arranged in double rows on glass slides, one row being of specific serum and the other of normal serum ten times less dilute than the specific serum employed. A platinum needle holding a small amount of suspected colony is stirred first in its drop of normal serum and then passes direct to its drop of specific serum.

The various phases of the stool examination are conducted in the main by workers working in twos, one more or less trained, the other more or less untrained.

H. S.

Esch (P.). **Fleischnatronagar als Choleraelektivnährboden.** [Alkaline Meatagar for the Selective Growth of *V. cholerae.*—*München. Med. Woch.* 1915. June 8. Vol. 62. No. 23. p. 790.

To prepare the medium the author uses beef or fish and heats 500 gm. with 250 cc. normal soda in an aluminium pot. When dissolved it is filtered through cambric and sterilised. This medium is mixed, as needed, with neutral agar 3 : 7 ; plates should be thinly poured or somewhat less than 30 per cent. of the medium be added to the agar, otherwise cholera vibrios as well as the dysentery, typhoid and coli groups may be inhibited. After drying for one hour at 60° and standing open for 24 hours the plates are ready for use. Like Dieudonné's and other cholera agars this medium can be supplied in dried form, in which case plates can be used immediately after pouring, but as the selective power of the medium has been somewhat lowered by the drying process 36 per cent. should be added to the agar. The author considers better results are obtained than by other methods and specifies that transparency of the medium helps in the search for and recognition of cholera colonies.

H. S.

von Lingelsheim (W.). **Zur Frage der Verwendbarkeit alkalischer Blutnährböden für die practische Choleradiagnose.** [The Use of Alkaline Bloodagar for the Diagnosis of Cholera.]—*Cent. f. Bakt.* 1. Abt. Orig. 1915. May 20. Vol. 76. No. 2/3. pp. 108–110.

The author found Pilon's modification of Dieudonné's medium to be almost as inhibitory as the original, when freshly prepared ; only after letting the mixture of blood and sodium carbonate stand at room temperature for 1–2 days or at 37° for 12–14 hours, before adding it to the agar, could a good result be obtained with the medium. The author also found that, after standing thus, sterilization by heat was possible for the blood-carbonate mixture, and that when sterilized the mixture would keep indefinitely. The media prepared with haemoglobin in place of blood (Esch's and Kabeshima's) encourage the growth of *V. cholerae*, but are not as inhibitory for other organisms as Dieudonné's medium and Pilon's.

H. S.

Lange (Carl). **Ein neuer Nährboden für die Choleradiagnose.** [A New Medium for the Diagnosis of Cholera.]—*Deut. Med. Woch.* 1915. Sept. 16. Vol. 41. No. 38. pp. 1119–1120.

The principle on which this medium is based is that there are very few faecal bacteria, normal or pathological, other than *V. cholerae*, which in a highly alkaline medium can attack starch, producing on alkaline starch agar colonies surrounded by large transparent areas.

A 5 per cent. starch solution is prepared and autoclaved. One part of this is added to six parts of an alkaline agar containing 40 cc. of 10 per cent. sod. carb. to 1000 cc. of nutrient agar. After 14 hours the transparent areas begin to appear. Other faecal organisms which produce the same, can be differentiated by a practised eye apart from the ultimate agglutination test.

The advantages claimed by the author for his medium over Dieudonné's are :—The greater distinctness with which cholera colonies stand out, the better agglutinability possessed by these colonies, and the more rapid growth that occurs.

H. S.

SCHOEBL (Otto). **Practical Experience with some Enriching Media recommended for Bacteriological Diagnosis of Asiatic Cholera.**—*Philippine Jl. Sci.* Sect. B. Trop. Med. 1915. Mar. Vol. 10. No. 2. pp. 127–144.

After presenting the protocols of his work in sixteen tables, the author summarises his results, pointing out that for practical purposes the bacteria likely to grow in enriching media can be divided into three groups :—

(1). Bacteria which prefer an acid medium ; these are the lactose fermenters, i.e. the coli group ; they are present to a marked degree but can be sufficiently suppressed by the use of an alkaline enriching medium ; they do not grow on Dieudonné's agar.

(2). Bacteria which prefer a strongly alkaline medium, viz., cocci ; few in numbers and of little importance.

(3). Bacteria which stand much in the same relationship to alkalinity of medium as *V. cholerae* does and are manifestly eager competitors with it.

Peptone water of varied reaction was tested and that with a –1 reaction found to give the best results.

Ottolenghi's bile medium, dry bile in place of fresh being used however, gave bad results and failed three times out of five to grow the vibrio. Kraus's medium, a liquid variant of the Dieudonné agar, was very good and may be regarded as considerably superior to peptone water. The author suggests that a combination of peptone water and a selective enriching medium might give still better results.

H. S.

VIOLLE (H.) & CRENDIROPOULO. **Note sur le Choléra expérimental.**—*C. R. Soc. Biol.* 1915. June 25. Vol. 78. No. 11. pp. 331–332.

Experimenting on rabbits the authors find that only when a loop of small intestine is ligatured at both ends does inoculation of cholera vibrios into that portion of the bowel give rise to typical cholera lesions and a multiplication of the vibrios injected ; the shorter the piece of intestine thus tied off, the higher its situation and the greater the virulence of the organism used, the more severe will these lesions be. Cholera vibrios injected even in enormous numbers into the untied intestine or indeed into the intestine after ligature at one place only, disappear within 24 hours. Cholera vibrios injected intravenously pass through the bowel wall, causing however lesions not typical of cholera. If in an animal thus intravenously inoculated a loop of small intestine has been tied off, the lesions are no more characteristic nor the numbers of vibrios greater in the ligatured portion than elsewhere.

H. S.

Days after last Inoculation.	Cholera Agglutination.				Typhoid Agglutination.			
	Titre.	Rabbits.			Titre.	Rabbits.		
		I. Cholera.	III. Mixed.	IV. Mixed.		II. Typhoid.	III. Mixed.	IV. Mixed.
7	1 : 3500	++++	++++	++++	1 : 3500	++++	++++	+++
	1 : 3800	+++	+++	+++	1 : 4000	++++	++++	++
	1 : 4000	+++	+++	+++	1 : 5000	++++	++++	++
	1 : 4500	+	+	+	1 : 6000	++++	+++	+
	1 : 700	+	+	+	1 : 7000	+++	++	0
	,,	,,	,,	,,	1 : 7500	+++	+	0
	,,	,,	,,	,,	1 : 12000	++	+	0
	,,	,,	,,	,,	1 : 13000	+	+	0
14	1 : 4000	+	+	+	1 : 5000	++++	+++	+
	1 : 9500	+	+	+	1 : 9500	+++	++	+
	,,	,,	,,	,,	1 : 10000	++	+	?
	,,	,,	,,	,,	1 : 12000	?	0	0
21	1 : 500	+++	++	+++	1 : 3000	++++	++	+
	1 : 4000	++	++	++	1 : 4000	+	+	+
	1 : 5000	+	+	+	1 : 5000	+	?	?
	1 : 10000	+	+	+	1 : 6000	0	0	0
38	1 : 250	++	++	++	1 : 2500	++++	+	+
	1 : 1500	+	++	++	1 : 3000	++	+	+
	1 : 2000	+	++	++	1 : 9500	+	0	0
	1 : 7000	?	+	+				
49	1 : 100	+	+	+	1 : 500	++++	+	?
	1 : 300	+	+	+	1 : 1000	+++	0	0
	1 : 400	0	0	0	1 : 2000	0	0	0

DANILA (P.). **Sur la vaccination avec du vaccin mixte: typhique + cholérique.**—*C. R. Soc. Biol.* 1915. Aug. 6. Vol. 78. No. 14. pp. 479–481.

To test the soundness of the plea for a simultaneous inoculation of typhoid and cholera vaccines rabbits were inoculated—I. with ·5 cc. cholera vaccine, II. with ·5 cc. typhoid vaccine, III. and IV. each with ·5 cc. of both typhoid and cholera vaccine. The doses were twice repeated at weekly intervals and the serum tested for agglutination as shown in the table.

To decide if the failure of rabbits III. and IV. to attain or to retain a typhoid agglutination titre as well as Rabbit II. is not merely due to a difference in individual response of different rabbits, the author is repeating the experiment. The results are not to hand yet. However, as it has been thought that immunity does not run parallel with agglutinating power, the author concludes that the only proof of the efficacy of a simultaneous inoculation will be obtained in the practice of it.

H. S.

FERMI (C.) & CANO (U.). **Sulla Disinfezione dell' intestino in generale in relazione all' infezione colerica.** [The Disinfection of the Intestine generally and with Regard to Cholera.]—*Policlinico.* Sez. Prat. 1914. Nov. 1. Vol. 21. No. 44. pp. 1537–1540; and *Ann. d'Igiene Sperimentale.* 1915. Vol. 25. (N. Ser.) No. 3. pp. 241–246.

Trying to obtain complete sterilisation of the post-mortem gut, or at any rate to get rid of cholera vibrios inoculated into it, the authors made the following experiments. Pieces of intestine about 10 cm. long were tied at one end and suspended in a moist chamber at 37°; for purposes of complete sterilisation they were then filled with various disinfectants, such as *corrosive sublimate, tincture of iodine, lysol, formaline,* etc., and the contents examined after 1–4 days for sterility; in no case however was it obtainable with a solution that could possibly be used *intra vitam.*

To test their second point, similar pieces of intestine were inoculated with ½ cc. of cholera broth culture, examined for the presence of the organism after five hours, filled with various antiseptics and then re-examined after another five and ten hours' incubation. With the following solutions, *methylene blue, crystal violet, trypan red, trypan blue* (all 1 per cent.), *Giemsa, malachite green* 1 *per cent.* + *eosine* 1 *per cent.*, *cresoline* 1–2 *per cent.*, the vibrios had disappeared after five hours; with *potassium permanganate, eosine, acid fuchsine, basic fuchsine* (all 1 per cent.) not until ten hours had elapsed. [It is not clear if the pieces of intestine were used faecal contents and all, and it was apparently not tested if the cholera vibrios had been eliminated from the intestinal wall itself.] The authors intend examining the effect of these disinfectants when used on the living intestine.

H. S.

GILDEMEISTER (E.) & BAERTHLEIN(Karl). **Beitrag zur Cholerafrage** [Asiatic Cholera.]—*München. Med. Woch.* 1915. May 25. Vol. 62 No. 21. pp. 705–708.

Seventy stools were examined for the longevity of the cholera vibrio in them under the following conditions: the samples of stool were

small, generally 10–15 cc. and placed in Petri dishes close to the window (but protected from direct sunlight) of a laboratory which had a temperature of 12°–21° C. (average = 18°), the examination taking place in the months December-March with the result given in the table.

Days the V. cholerae remained alive.	Number of stools.	Days the V. cholerae remained alive.	Number of stools.	Days the V. cholerae remained alive.	Number of stools.
1	18	13	3	25	1
2	2	14	–	26	2
3	3	15	2	27	2
4	2	16	2	28	1
5	1	17	3	29	1
6	1	18	1	30	–
7	1	19	1	31	1
8	2	20	4	34	1
9	3	21	–	36	1
10	2	22	3	37	1
11	2	23	–	51	1
12	1	24	1		

Among those which could retain live vibrios, on occasion, for weeks were the stools of carriers. The authors recognised that under natural conditions, such as on the surface of the ground in a wood or meadow, the longevity may be greater. For isolation purposes they used with good results a haemoglobin extract-alkali-soda agar similar to Kabeshima's, which was *ready for use as soon as sterilised.* This substitute for Dieudonné's medium was prepared as follows:—3½ g. haemoglobin-extract are dissolved in 10 cc. physiological saline; 10 cc. of 5·55 per cent. solution of water free soda and 2 cc. caustic potash [? strength] is added and the whole sterilised for ¼ hour in the steamer. When cooled to below 50° C. 80 cc. of a 3 per cent. agar, neutral to litmus, are added and plates poured. After a short drying in the incubator the plates are ready for use.

H. S.

i. Munson (E. L.). **Cholera Carriers in Relation to Cholera Control.**—*Philippine Jl. Sci.* Sect. B. Trop. Med. 1915. Jan. Vol. 10. No. 1. pp. 1–9.

ii. Schoebl (Otto) **Observations concerning Cholera Carriers.**—*Ibid.* pp. 11–17.

i. In the Manila 1914 cholera epidemic it was realized that the recognition and isolation of cholera carriers were very valuable and necessary combative measures. A search for carriers through the whole population being impracticable, direct contacts, persons in the neighbourhood of a number of cases and those employed in the handling of food and drink on a large scale, such as in restaurants and factories, were chosen for examination. During July-October roughly 30,000 of such persons were examined and 1·75 per cent. found to be carriers; in some districts the percentage was as high as 2·4 and in Bilibid prison

no less than 5 per cent. Some developed the disease after "carrying" for as long as 17 or 18 days, one of these cases dying within 8 hours of the onset of illness. Some idea of the length of time carriers harbour the vibrio is given by the detention returns of San Lazaro hospital. In July the average period of detention was 7–8 days, in August 7 days and in September 10–11; though it must be remembered that intermittent carriers may have been released before the vibrio had really and permanently disappeared. No good results were obtained by treating carriers. During treatment with 0·6 gram doses, twice daily, of salol as intestinal antiseptic, four cases of cholera supervening in carriers occurred, one of them being fatal.

ii. The author, whose observations were made in Manila during the 1913–1914 outbreak, gives the following figures as to length of time vibrios were found in the stools of cholera patients and carriers:—

For from	2–7	days	in	43	cases.
,,	7–14	,,	,,	22	,,
,,	14–21	,,	,,	6	,,
,,	21–28	,,	,,	5	,,
For	48	,,	,,	1	,,

The author agrees with Greig that it is the gall bladder and duct which harbour the vibrio; he found an infected gall bladder in 17 and a pathological gall bladder in 3 of the 39 he examined. In five embryos of mothers dying of cholera no cholera vibrios were found anywhere, except in the waters of one in which the sac was found perforated. In 41 examinations of 27 patients and convalescents with *V. cholerae* in their stools no case of vibrionuria was detected.

H. S.

Greig (E. D. W.). **Note on a Cholera "Carrier" in Relation to the Water Supply of Calcutta.**—*Indian Jl. Med. Research.* 1915. Apr. Vol. 2. No. 4. pp. 926–933.

Since December 5th 1914 a daily examination (in place of a weekly one) of the water supply of Calcutta has been instituted. The water comes from the Hooghly and passes through settling tanks, filter beds and collecting wells to the Tallah reservoir. Here from this reservoir of filtered water which supplies Calcutta directly, on three occasions vibrio infected samples were obtained, on December 21st, December 23rd 1914 and January 10th 1915. The author isolated the true cholera vibrio and a cholera-like strain and, seeing that cholera was not particularly prevalent at the time and that the contamination was found only at this one link in the chain of the water supply, he looked for the source of the contamination in some person working at the reservoir and a cholera carrier at the same time. He found this person in a Hindu employee who collected the samples from the reservoir for examination. The stools of this man were examined on six occasions; on three no vibrios at all were isolated; on two a cholera-like vibrio; at length 15 *days after the first examination* the true cholera vibrio was detected. On one occasion a cholera-like strain was cultivated from the man's hands. The man gave a history of cholera when five years old (37 years previously) and of having been inoculated by Haffkine against cholera (living vaccine) at the age of

about 20 and of having been ill for three days subsequently. The water samples in question were taken by lowering a bottle (not touched by the worker's hands) into the reservoir; probably contamination took place during the subsequent plugging of the bottle. H. S.

STEIN. **Cholerabazillenträger und ihre epidemiologische Bedeutung** [Cholera Carriers and their Importance Epidemiologically.]—*Wien. Klin. Woch.* 1915. July 8. Vol. 28, No. 27. pp. 737–739.

In the course of a lecture containing little that is new, the author declares that a subsequent "carrying" of cholera vibrios by his patients [no numbers given] who had had cholera badly, was prevented by his method of treatment, viz., a single dose of anticholera serum combined with a hypertonic saline injection, given simultaneously and intravenously. An interesting case of cholera is mentioned in which, although examined on 20 occasions, no cholera vibrios were ever detected. The gall bladder was swollen and tender and it is suggested that an infection of that organ only had occurred. H. S.

OLSSON P. G.). **Zur Variation des Choleravirus.** [The Variability of the Cholera Organism.]—*Cent. f. Bakt.* 1. Abt. Orig. 1915. May 14. Vol. 76. No. 1. pp. 23–37.

For an explanation of the facts that cholera epidemics usually commence in autumn or late summer and that water-borne infection may be much more severe than contact infection, the author devoted himself to the study of the variability of *V. cholerae.*

From months-old dung cultures of *V. cholerae* growing at room temperature the author was able to obtain, on agar plates at 37° for 20 hours and then at room temperature for 8 days, a certain number of abnormal colonies. These were conspicuous by their wrinkled surface, irregular edge, brownish colour, opacity and adhesive character, emulsification taking place with difficulty. The bacteria from such colonies were no longer motile, formed barely any skin on the surface of broth, but liquefied gelatine, gave the cholera red reaction and had the characteristic cholera smell. This altered strain retained its new character after repeated subculture on agar and after passage through guinea-pigs.

The cattle dung was used after the addition of an equal quantity of water and sterilization at 120° for ½ hour. It was of neutral reaction. By varying the conditions of experiment it was ascertained that length of growth on dung, an optimum temperature of from 18–20° for the subculture from the dung on to agar, with dryness of the agar surface, shallowness of the agar plate and a thick sowing, favour the development of these wrinkled colonies, but that after a sufficiently long period in the dung the abnormal colonies are obtained at high temperatures and on moist, deep plates as well. Not only by long continued growth in the dung is variation in the cholera organism induced; in broth to a somewhat less degree and in algal pond mud also though only to a slight extent, after two months at temperatures between 25° and 16°, the optimum being 18°–20°, similar wrinkled colonies appear on subculturing on to agar; old gelatine cultures on the other hand never exhibit this tendency.

OLSSON'S TABLE SHOWING CYCLIC DEVELOPMENT.

	Cyclic development of the Cholera bacterium in seven stages.						
Stages.	1	2	3	4	5	6	7 = 1 with raised virulence.
Method.	Departure from normal bacterium.	After growing in dung 2–6 weeks.	After growth in the same dung for 4–6 further weeks.	After further growth of several weeks in fresh dung.	After daily sub-culturing on to fresh agar.	After growth on agar 1 day at 37° then 3–5 weeks at room temperature.	Growth of the coccal forms on agar for 20 hours at 37°.
Colony on agar plate.	Typical.	Typical.	At 37° typical at room temperature wrinkled.	Wrinkled at rising temperatures, eventually at 37°.	Typical at sinking temperatures, eventually typical even at 14° and on dry agar surface.	Typical.	Typical.
Bacterium on agar.	Normal.	Large and non-motile.	At room temperature short and non-motile.	Same as 3.	Same as 3.	At first same as 3, eventually coccal forms.	Normal, motile.
Virulence for guinea-pig of 200 g.	Minimum lethal dose = 2–3 loops.		Lower than 1.		Somewhat higher than 3.		Minimum lethal dose = $\frac{1}{4}$ loop.

Twelve other cholera strains were tested on dung and in every case, with the exception of the strain El Tor, the same variation resulted. In El Tor the only change brought about was that colonies grew somewhat irregularly and vine-leaf-like and that after as long a stay as nine months in dung.

To induce in this altered bacterium a return to its usual condition the author started with a culture growing wrinkled at 40°, subcultured daily on to a fresh agar slope, plating out on agar at the same time to search for unwrinkled colonies. On the sixth day a few unwrinkled colonies appeared and from one of these subcultures were made as follows: from an agar slope at 40° was sown an agar plate at 37°, followed by a slope at 40° from a 37° plate colony until unwrinkled colonies grew at 37°. Having thus obtained a culture growing unwrinkled at 37°, by the same method unwrinkled growth at lower temperatures was induced. On thus finally converting a wrinkled growth into one unwrinkled at all temperatures, the author found that the culture *had gained in virulence*, as compared both with the unwrinkled culture he had begun with and the wrinkled variant he had produced from it. In three of the eleven other cholera strains which were converted from the unwrinkled to the wrinkled form, reconversion to the original type with rise in virulence was accomplished.

The cyclic development produced by the author is shown in the table on page 505, it being seen that in the dung the bacteria become gradually longer and non-motile, that grown on agar again and at low temperatures in the wrinkled colonies short and non-motile forms prevail, that by further cultivation on agar normal colonies reappear with at last normal motile vibrios. The virulence is then greater than at other stages of the cycle.

Although the altered character of the cholera vibrio remained unchanged after months of subculturing and survived many passages through animals, the author prefers to call the variant, with ALMQUIST, an example of "relative heredity," reserving the designation "mutation" for such processes as give variants which remain constant for years under all conditions, and he considers that no sure proof of mutation in this strict sense occurring in the bacterial world has been established.

H. S.

MAZZETTI (Loreto). **Modificazione del potere di riduzione del Vibrioni colerico.** [The Variability in the Reducing Power of *V. cholerae*.] —*Riforma Med.* 1915. June 26. Vol. 31. No. 36. pp. 709–712.

According to EMMERICH the nitrous acid produced in the human intestine by *V. cholerae*, from the nitrate introduced with the food, damages the vibrios to such an extent that an epidemic would not be possible, did not these altered vibrios acquire again and in exalted measure during a sojourn in the soil under certain circumstances the power of reducing nitrates to nitrites and thus increase their toxicity. The author carried out experiments to prove the possibility of an alteration in the reducing capabilities of *V. cholerae* under conditions suggested by EMMERICH's theory and considers that, although the figures he obtained owing to his not having used soil according to

EMMERICH'S prescription were not as conclusive as those given by that worker, they nevertheless support his views. The author employed a vibrio isolated two years previously and cultivated since then on artificial media. The following table allows of a comparison of the different amounts produced by the organism at the two stages in its existence.

TABLE I.

	Nitrous acid produced per 100 cc. peptone water containing 1 per cent. sodium nitrate after days of incubation.				
	1	4	5	8	10
Vibrio cholerae recently isolated from a cholera case	gr. 0·048	gr. 0·20	gr. 0·22	gr. 0·285	gr. 0·30
Same strain after two years of saprophytic existence	gr. 0·1	gr. 0·13	gr. 0·187	gr. 0·238	gr. 0·262

Using garden soil and an apparatus by means of which a tubeful of the dry, sterilized earth after inoculation on the surface with a few drops of cholera culture could be gradually moistened by capillary attraction from below with peptone water containing 1 per cent. sodium nitrate, the author by removing from time to time samples of the surface earth looked for an alteration in the reducing power of the vibrio, with the result, shown by a comparison of Tables I. and II., that although a slight increase is occasioned the amount of nitrous acid produced does not equal that obtained when the culture was a recently isolated one.

TABLE II.

V. cholerae taken from the soil after days.	Nitrous acid produced per 100 cc. peptone water containing 1 per cent. sodium nitrate after days of incubation.			
	5	10	15	20
4	gr. 0·154	gr. 0·280	gr. 0·280	gr. 0·280
8	gr. 0·171	gr. 0·270	gr. 0·270	gr. 0·270
12	gr. 0·143	gr. 0·171	gr. 0·171	gr. 0·230
16	gr. 0·211	gr. 0·200	gr. 0·230	gr. 0·270
20	gr. 0·171	gr. 0·200	gr. 0·250	gr. 0·250

Tables III. and IV. give the result of experiments to establish the effect of drying and of exposing to the sun *V. cholerae* both in agar slope cultures and inoculated into soil spread 1 cm. deep in Petri dishes, samples being subsequently inoculated into peptone water + 1 per cent. sodium nitrate to test the nitrous acid producing qualities.

TABLE III.

Agar culture.	Nitrous acid produced per 100 cc. peptone water containing 1 per cent. sodium nitrate after hours of incubation.		
	48	96	144
Control	gr. 0·016	gr. 0·042	gr. 0·084
Exposed to sun for 24 hours	gr. 0·01	gr. 0·032	gr. 0·14
Stood in room to dry for four months	gr. 0·013	gr. 0·032	gr. 0·079

TABLE IV.

	Nitrous acid produced per 100 cc. peptone water containing 1 per cent. sodium nitrate.		
Days of incubation.	Control: Vibrios taken from soil moistened by capillarity with nitrate broth.	Vibrios taken from soil exposed to drying influences for 1 month.	Vibrios taken from soil exposed to sun for 30 hours.
1	gr. 0·066	gr. 0·00285	gr. 0·0019
5	gr. 0·154	gr. 0·0066	gr. 0·0876
10	gr. 0·161	gr. 0·14	gr. 0·228

Even though after exposing the vibrios in soil to the sun's rays a raised power of reducing nitrates is called forth, it still does not equal that of the organism when recently isolated. The result of keeping *V. cholerae* in various types of water and under anaerobic conditions is shown in the following tables :—

TABLE V.

Number of days the vibrios remained in the various waters.	V. cholerae were placed in			
	Drinking water from the Serino sterilized.	Sea water sterilized.	Sewer water sterilized.	Faecal Emulsion sterilized.
	Nitrous acid produced in 10 days per 100 cc. peptone water containing 1 per cent. sodium nitrate.			
1	gr. 0·244	gr. 0·33	gr. 0·20	gr. 0·21
4	gr 0·21	gr. 0·33	gr. 0·16	gr. 0·19
8	gr. 0·175	gr. 0·30	gr. 0·16	gr. 0·175
12	gr. 0·175	gr. 0·30	gr. 0·16	gr. 0·175

TABLE VI.

Number of days under anaerobic conditions.	Nitrous acid produced in 10 days per 100 cc. peptone water containing 1 per cent. sodium nitrate.	Observations.
1	gr. 0·161	A control under aerobic conditions gave 0·25 per cent. nitrous acid.
4	gr. 0·15	
8	gr. 0·15	
12	gr. 0·15	

H. S.

SUESSMANN (Ph. O.). **Die Verwendung von Drigalski-Schalen zur Gewinnung von Typhus- und Cholera-Impstoff mit Hilfe eines einfachen Apparates.** [A Safety Apparatus for the Washing off of Typhoid and Cholera Culture from Petri Dishes.]—*Cent. f. Bakt.* 1. Abt. Orig. 1915. June 28. Vol. 76. No. 4. pp. 288–294. With 3 figs.

An ingenious but complicated piece of apparatus designed to enable an inexperienced laboratory attendant to emulsify cholera cultures grown on Petri dishes, with minimum risk of infecting himself and with diminished opportunities of a contamination of the vaccine with air organisms ; the whole process is carried on in a closed metal box with glass front, it being possible to wash off in this way some 35 plates an hour. [The keeping clean and sterile of the apparatus would not appear to be an easy matter.]

H. S.

GIESZCZYKIEWICZ (M.) & SIERAKOWSKI (St.). **Ein choleraähnlicher Vibrio.** [A Cholera-like Vibrio.]—*Cent. f. Bakt.* 1. Abt. Orig. 1915. Aug. 25. Vol. 76. No. 7. pp. 465–469.

Isolated on Dieudonné from the rice water stools of a patient whose only symptom was diarrhoea, the vibrio while being morphologically like *V. cholerae* did not agglutinate with nor absorb from a true cholera serum. It was virulent for guinea-pigs and pigeons, proving fatal for the former in the dose of 1 mg. intraperitoneally and for the latter in the dose of 1 loop intramuscularly. Grown on blood agar plates the vibrio caused marked haemolysis. By passing a 10 days old broth culture through a Berkefeld filter very little exotoxin could be detected, 5 cc. of the filtrate being needed to kill a guinea-pig. No marked agglutination affinity to a number of other well-known cholera-like vibrios could be found.

H. S.

GREENWOOD Jun. (M.) & UDNY YULE (G.). **The Statistics of Anti-Typhoid and Anti-Cholera Inoculations and the Interpretation of such Statistics in General.**—*Proc. R. Soc. Med.* 1915. July. Vol. 8. No. 9. (Sect. of Epidemiol. & State Med.). pp. 113–190.

Concerned almost entirely with the statistics of anti-cholera inoculation and their interpretation, the paper is divided into four sections. Section I. deals with the conditions under which data

are valid. Section II. examines the existing data. Section III. puts forward a statistical theory for the interpretation of the results of inoculation. Section IV. views the possibility of a comparison of efficiency of immunisation in the case of different diseases.

Section I. In determining the result in respect of immunity to a certain disease ensuing to a portion of the population from the inoculation of that portion with the organism of the disease in question, it is necessary to decide (1) whether there is a significant difference between the attack (or fatality) rate of the inoculated and the uninoculated portions ("Is the observed difference greater than we could fairly attribute to the action of chance ?") and (2) if so, to what extent the inoculated portion profits by that treatment, and how one may compare one set of data with another.

To attempt this one must be supplied with valid data, i.e. data which conform to the following conditions:—(*a*) The inoculated must resemble the uninoculated in all material respects, e.g. age, sex, and social and racial constitution, unless it is known that these do not exert influence in respect of the disease. (*b*) Exposure to the disease must be equal for the inoculated and uninoculated. An inoculated population of one year may not be compared with an uninoculated population of another year, unless it is known that the disease remains constant with regard to infectivity and severity year in year out, which is not the case with cholera. The cases or fatalities among inoculated and uninoculated are not comparable, if it took an appreciable portion of the time of epidemic to carry out the inoculation, some of the inoculated in that case being exposed to the disease, *as inoculated*, for periods shorter than the whole time of epidemic, while the uninoculated naturally are exposed throughout all the epidemic. (*c*) There must of course be no question of conscious or unconscious bias in the classification of cases, where doubt exists as to whether inoculation has or has not taken place or where the diagnosis of the disease is uncertain.

A guarantee of the accuracy of data is obtainable when one has a series of observations on the attack, or fatality, rates in various outbreaks of the same disease. The returns for inoculated and uninoculated bear a definite relationship to one another in every case. A departure from this correlation would indicate the untrustworthiness of the data. In addition to the above conditions necessary for the reliability of the data, these data must be based on a sufficiency of observations, obviating the interference of chance. To decide whether the difference in immunity observed as the result of inoculation is a real one or merely a chance grouping of figures, it is necessary to examine the figures and this is generally done with the aid of the criterion which was introduced by Professor PEARSON and is stated as follows:—"If we know *a priori* that a table containing n "cells" should include $m_1, m_2, m_3 \ldots m_n$, observations in the respective cells, then, if the standard errors of sampling and the correlation in errors of the various cells are of a certain form, the probability that fluctuations of sampling alone would give rise to a system of deviations $m_1 - m_1', m_2, m_2' \ldots m_n - m_n'$ where $m'_1, m_2', m_3' \ldots m_n'$ are the actually observed contents of the "cells," or to any system of wider deviations, is a function of $\mathop{S}_{1}^{n} \frac{(m_n - m_n')^2}{m_n} = \chi^2$."

It is found that "if the number of subdivisions be 4 and $\chi 2$ computed as above on the basis of some assumed theoretical distribution be 1, then the chance (P) is about 8 in 10 that errors of sampling would lead to as great a discrepancy as or a greater discrepancy than that actually observed between theory and observation." With an increase in the value of $\chi 2$ the likelihood of the difference being due to chance rapidly diminishes, thus with $\chi 2$ equalling 17, P is less than 1 in 1,000, and with $\chi 2$ equalling 30, P is only 1 in 1,000,000. The authors consider that this $\chi 2$ criterion possibly errs on the side of caution and that perhaps to ascertain the degree of probability that the difference between $\frac{\text{inoculated attacked}}{\text{all inoculated}}$ and $\frac{\text{uninoculated attacked}}{\text{all uninoculated}}$ might be due to chance would be a sufficient precaution.

In *Section II.* data from various sources are examined. From Haffkine's eight tables are drawn up and the $\chi 2$ values calculated; only in three cases is $\chi 2$ greater than six for which $P = 0{\cdot}11$.

Table III.—Calcutta, 1894–96. Persons exposed from Fifth to Four Hundred and Sixteenth Day after Inoculation.

	Not attacked.	Attacked.	Total.
Inoculated	276	3	279
Not inoculated ..	473	66	539
Total	749	69	818

$\chi 2 = 29{\cdot}70$. P = less than 0·0001.

Table IX.—Margherita Coolies. Inoculations during an Epidemic, 1895. Vaccines I. and II.

	Not attacked.	Attacked.	Total.
Inoculated	192	4	196
Not inoculated ..	113	34	147
Total	305	38	343

$\chi 2 = 37{\cdot}92$. P = less than 0·0001.

Table X.—Cachar Tea Estates Coolies, 1895–96. Vaccine II.

	Not attacked.	Attacked.	Total.
Inoculated	5,751	27	5,778
Not inoculated ..	6,351	198	6,549
Total	12,102	225	12,327

$\chi 2 = 111{\cdot}92$. P = less than 0·0001.

These three tables III., IX., and X. furnish evidence of the value of Haffkine's inoculations.

Powell's results are included in the Cachar figures of Haffkine.

MURATA's data are poor and supply only two cases (see Tables XVII. and XXV.) giving the $\chi 2$ standard, but while one of these favours inoculation, the other would counterindicate its use. MURATA used a high temperature (60°) for killing his vaccine and gave apparently only one small (2 mg.) dose.

TABLE XVII.—Koobe.

	Not attacked.	Attacked.	Total.
Inoculated	14,939	20	14,959
Not inoculated ..	243,328	753	244,081
Total	258,267	773	259,040

$\chi 2 = 14{\cdot}48$. $P = 0{\cdot}0024$.

TABLE XXV.—Ibo.

	Not attacked.	Attacked.	Total.
Inoculated	9,587	3	9,590
Not inoculated ..	86,032	1	86,033
Total	95,619	4	95,623

$\chi 2 = 18{\cdot}7$. $P = 0{\cdot}0003$.

NIJLAND does not give details as to how his vaccine was prepared or given; his figures are mainly approximations; so that though six out of his eight tables fulfil the $\chi 2$ test, prophylactic inoculation is not materially supported by his statistics.

ZABOLOTY's data are considered by the authors to be unuseable owing to lack of detail.

From the most of SAVAS's data it was found difficult to extract reliable information owing chiefly to the fact that inoculation was for the most part a long drawn out process taking place during the epidemic. It is clear that those of the population who received their inoculation late in the epidemic were exposed, as inoculated persons, to the disease not only for a shorter period than the epidemic lasted, but also to it when it was less virulent, it being always the case that infectivity declines during a cholera epidemic. The results of inoculation in the Sanitary Corps of the Greek Army are, however, considered of the greatest value. This body of men was inoculated before cholera broke out, this being in the opinion of the authors the only vital difference in respect of immunity between them and the combatants, with whom they are compared in Table XXXIX. The Sanitary Corps and the combatants belonged to the same social class, the fact that the former had had a short course of sanitary instruction being counterbalanced, in the authors' opinion, by the fact that from the nature of their occupation they were exposed to infection to a greater degree than were the combatants.

TABLE XXXIX.—Savas's Data.

	Not attacked.	Attacked.	Total.
Sanitary corps ..	2,884	13	2,897
Combatants	112,613	2,192	114,805
Total	115,497	2,205	117,702

$\chi 2 = 32{\cdot}79$. P = less than 0·0001.

Summarizing these various data the authors come to the conclusion that inoculation against cholera does result in benefit to the inoculated.

Section III. discusses the problem "whether any hypothesis as to the meaning of immunisation can be found of sufficient definiteness to enable us to predict the form" of a single-valued functional relation, existing between the death- or attack-rates of inoculated and uninoculated. The theory promulgated is then tested on data furnished by cholera inoculation, swine fever, diphtheria, scarlet fever and infantile mortality statistics.

In *Section IV.* the possibility of a comparison of the efficiency of inoculation in the case of one disease, say cholera, with that of inoculation in the case of another, say typhoid, is discussed at length and the decision arrived at that none of the various coefficients proposed supplies a statistical measure.

The authors consider it a mistake for statisticians to devote themselves entirely to such mathematical difficulties; they should give due attention to the biological difficulties of interpretation which are encountered.

H. S.

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